

# **PACIFIC SEABIRDS**



**A Publication of the Pacific Seabird Group**

**Volume 23 Number 1**

**Spring 1996**

# Dedicated To The Study And Conservation Of Pacific Seabirds And Their Environment

The Pacific Seabird Group (PSG) was formed in 1972 out of a need for better communication among Pacific seabird researchers. The Group coordinates and stimulates the field activities of members involved in research and informs its members and the general public of conservation issues relating to Pacific seabirds and the marine environment. Group meetings are held annually and the PSG publication, *Pacific Seabirds* (formerly the *PSG Bulletin*), is issued biannually. Current activities include involvement in seabird sanctuaries, coastal surveys, seabird/fisheries interactions, and legislation. Policy statements are issued on conservation issues of critical importance. Although PSG's primary area of interest is the west coast of North America and adjacent areas of the Pacific Ocean, it is hoped that seabird enthusiasts in other parts of the world will join and participate in PSG. PSG is a member of the U. S. Section of the International Council for Bird Preservation. Annual dues for membership are \$20 (individual and family); \$13 (student, undergraduate and graduate); and \$600 (Life Membership, payable in six \$100 installments). Dues are payable to the Treasurer (see Membership page for details and application).

## *Pacific Seabirds*

*Pacific Seabirds* (ISSN pending) is published twice a year, in the spring and fall, and contains news of interest to PSG members, including regional seabird research, conservation news, and abstracts of papers presented at the annual meeting. *Pacific Seabirds* is an outlet for the results of scientific research, as well as articles and shorter items on seabird conservation, seabird research activities, and other topics related to the objectives of PSG. All materials should be submitted to the Editor, while conservation-related material should be submitted to the Vice-Chair for Conservation. Back issues of the *Bulletin* or *Pacific Seabirds* may be ordered from the treasurer: please remit \$2.50 each for issues of Vols. 1-8 (1974-1981) and \$5.00 each for issues of Vol. 9 and later (see Membership page for details and order form).

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## Donations

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# PACIFIC SEABIRDS

A Publication of the Pacific Seabird Group



Dedicated to the study and conservation of Pacific seabirds and their environment

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# FORUM

## Conservation, Science And The Pacific Seabird Group

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When the Pacific Seabird Group was established, its founders coined the mission statement that still accompanies the logo on our letterhead and in *Pacific Seabirds*: "Dedicated to the Study and Conservation of Pacific Seabirds and Their Environment." It is worth considering how these goals make PSG a unique organization, and also a powerful force for the advancement of both causes.

As we all know, there are many well-established ornithological societies with journals serving as respected outlets for the published results of solid, peer-reviewed science. Many volumes of these journals have for decades, and still do, contain important original research on many aspects of seabird biology. By bringing together the membership of PSG, there has resulted a long and significant series of published symposia and technical papers, clearly on a par with the "mainstream" journals. (*Pacific Seabirds* is also increasingly seeking and including purely scientific papers in the classic sense.) But PSG was not formed to compete with these other societies, but rather to provide more focus and opportunity for those interested in seabirds to communicate, collaborate, and cooperate in a somewhat more narrowly-defined area of avian science. This trend towards more the restrictively defined orientation of specialized groups is clearly a growing trend in ornithology, as evidenced by the formation of, for example, the Raptor Research Foundation, and a proliferation of even more specialized groups. If you need to be convinced of this, read the Meeting Announcements section of any issue of the *Ornithological Newsletter*.

Yet, throughout the decades, the work of conserving natural resources has typically been the province of a wide variety of "environmental" groups. For the most part, these organizations consist of concerned individuals, often the "general public," who somehow receive guidance from the academic community with re-

gard to what species or ecosystems merit concern and protection. At the risk of offending the "pure" scientists among us, this scenario too often conjures up, for me, the image of Moses descending from on high with the Holy Tablets. Yet, to be fair, it is undeniable that conservation must be based on good science, and someone has to do that work.

There are, however, a sizable number of scientists, both within PSG and ornithological academia, who argue that "impartiality" must be maintained above all (i.e., don't get involved in conservation issues). By advocating a cause, they suggest, the door cracks open for suspicion of bias or conflict of interest. The image that haunts me with this argument is one of Nero fiddling while Rome burns. If we are capable and confident of the rigor of our science, why not should we, ostensibly the best informed, lead the effort to protect the life forms we study and are so important as components of complex marine ecosystems. The need is undeniable.

Most scientific societies grapple with this issue on some level or another. Many deal with the problem by passing conservation resolutions at annual meetings. Again, such actions are nevertheless often relevant, and are sometimes used by regulating agencies to buttress their stands on controversial issues.

Important developments in recent years seem to be changing this still somewhat isolationist attitude within the scientific community. First, whole new organizations such as the Society for Conservation Biology and the Society for Ecological Restoration are growing and gaining strength, with membership numbers now exceeding some of the "old-line" societies. The very premise of these groups revolves around the concept that good science and conservation advocacy are not mutually exclusive, but do indeed go hand-in-hand. Also, the establishment of the Ornithological Council and the American Bird Conservancy (PSG be-

longs to both) recognizes the necessity of rapid information transfer, the power of conservation alliances, and the reality of the political system. More power to them.

The point of this discussion is that PSG deserves to, and should, take great pride in being a pioneer organization in the successful melding of good science and influential conservation efforts. Although PSG cannot and should not necessarily support individual political candidates or urge our members to vote one way or the other on specific issues, we do not hesitate to provide agencies or legislators with science-based recommendations of great relevance to conservation. Read any PSG Conservation Committee report, or observe the success of the Marbled Murrelet Committee as prime examples.

You, as a PSG member, can contribute to this success. Ask any Committee Technical Coordinator or PSG officer how you can help. You will share the rewards and make a real difference.

*William T. Everett*, PSG Chair  
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## Improving The Reliability Of Marbled Murrelet Surveys In Low Abundance Areas

Each field season a great deal of time and money are spent surveying for Marbled Murrelets (*Brachyramphus marmoratus*) at inland sites in the Pacific Northwest. The Pacific Seabird Group's (PSG) survey protocol (Ralph et al. 1994) is generally accepted as the best method to plan and conduct these surveys. Guidelines in this protocol help insure that murrelet observers and the surveys they perform have a level of uniformity and quality which is higher than that for most other species. Failure to detect murrelets in potential timber harvest areas could have negative consequences for this threatened species. Murrelet survey results also can influence biologists' and manager's perceptions of habitat associations and inland distribution, which can have far-reaching and long-lasting effects on a variety of management activities.

Given the considerable effort that goes into planning and executing surveys, and the potentially major implications that survey results can have, we believe that aspects relating to observer reliability deserve more attention. Our intention is not to denigrate observers; surveying for murrelets, especially in low abundance areas, can be quite challenging. Survey conditions often include poor lighting, dense vegetation, extremely early wake-ups, and a dawn chorus consisting of the calls and songs of a variety of other bird species. Marbled Murrelets themselves further complicate matters with their crepuscular activity, cryptic plumage, 100 mph flight speeds, and secretive behavior near the nest. Add to this the possibility that observers may have attended a single murrelet training session, or be inexperienced field ornithologists, and the possibility of either false negative or false positive detections becomes apparent.

Here we offer some suggestions for assessing and improving the reliability of survey results in areas of low murrelet abundance or absence, such as far-inland sites. Observers working in these areas may not have the benefit of reinforcing their murrelet search-image with periodic

detections. Ironically, surveys in these low abundance areas therefore require a greater skill level than do surveys at higher abundance sites. Some of our suggestions are drawn from the experience of the birdwatching community, who accept the concept that observers, even the best qualified and most experienced, can make mistakes, and that not all reports of uncommon or extralimital birds are reliable. Persons interested in rare bird records have been known to go to great lengths to assess their reliability. We suggest that biologists adopt a similar critical approach to the evaluation of murrelet detections when they occur at unexpected locations. We emphasize evaluation of possible false positive detections; evaluation of possible false negative detections is problematic.

For low abundance areas, improved observer training and qualifications are necessary. Observers should be fully competent with the aural and visual identification of all other bird species which may be encountered during surveys. Not knowing the other species will result in observers attempting to look and listen through the other bird activity, rather than processing everything and picking out any Marbled Murrelets. Unfortunately, requiring all observers to be expert field ornithologists is unrealistic given the time required (i.e., years) to attain these skills and the large number of observers needed each field season. An alternate approach is to require observers to be fully competent with the identification of those species which can be confused with murrelets. We also support the suggestion by Ralph et al. (1994) that observers working in low abundance areas should periodically revisit areas of high abundance in order to refamiliarize themselves with murrelet identification. Other improvements in training such as more training and evaluation time at sites with different levels of murrelet activity (K. Nelson, pers. comm.) also should be considered.

The experience and credibility of observers reporting unusual detections

should be appraised (Contreras 1994). In addition to PSG evaluation results, factors to be considered should include observer scores during general bird identification field tests, other relevant education, training, and experience, and the opinions of past trainers and evaluators. Post-detection interviews with observers should also be conducted and documented. While determining observer credibility can be a difficult and uncomfortable process, the stakes are high enough to warrant scrutiny. Observer moral can suffer if evaluations are not conducted with some degree of sensitivity. It should also be noted that numerous years of surveying for murrelets in areas with very few or no detections may not substantially improve observer skill, compared to experience with land bird point counts or murrelet surveys in high detection areas.

Detailed documentation (e.g., Dittmann and Lasley 1992), in addition to that called for in the PSG protocol, should be submitted and archived. Documentation should include a written narrative of exactly what was seen or heard and why it was not a similar species, conditions at the time of the observation, and information on the observer. A list of all species detected can be illuminating when follow-up visits record confusing species that were missed on the original detection day. Sketches can be useful. Copies of original field notes, which are written immediately after the survey but before discussions with others, should also be included. If tape recorders are used, cassette tapes should also be submitted. Adequate documentation on file also provides later workers with an opportunity to review these detections. Observers should document detections in such a way that persons reading their report in the future, with no direct knowledge of the observer, can be convinced that they actually detected a murrelet. Our evaluation of one well documented far-inland detection revealed that the observer saw what appeared to be a murrelet in basic plumage

in late July. While possible, we consider this unlikely enough to warrant further scrutiny of this detection.

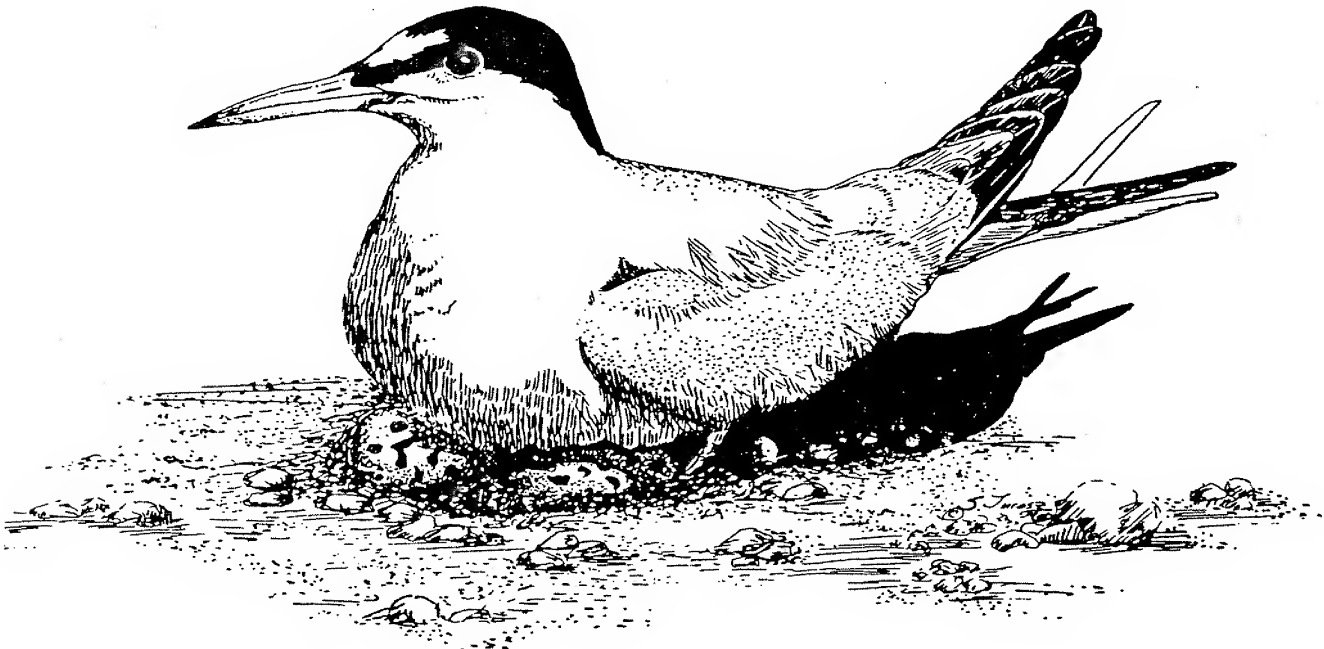
Biologists and managers should consider convening committees of knowledgeable individuals to evaluate (i.e., accept, reject, or designate as "possible") noteworthy Marbled Murrelet detections. This process could be similar to that employed by the various Bird Record Committees around the country (Roberson 1990, Patten et al. 1995). Things to consider would include what was seen or heard, conditions at the time, observer background, and the context of the observation. Every effort should be made to keep agency and personal politics out of this process. One example of what should be avoided in evaluating detections is the premise that a record should be accepted because it may help protect murrelet habitat. This philosophy has no bearing on whether a given detection is reliable or not. Furthermore, it can result in false expectations being placed on areas that have no conservation value for murrelets. This could harm not only the murrelet, but the credibility of wildlife professionals. We believe that a conservative management approach should be taken with

areas of unconfirmed or potential murrelet use. However, this consideration should not be part of the process of evaluating detections.

Further reliability in murrelet survey results may be attained by conducting prompt and thorough follow-up surveys at sites with questionable or unexpected detections. Follow-up visits should only be conducted by highly skilled field ornithologists. Potentially biased observers should not be used. Follow-up efforts should be rigorous; given the huge dollar value of the timber and the declining status of the species, weekly surveys (or more) over the course of several full seasons should not be considered excessive. Consideration should also be given to expanding the survey area to encompass other likely stands. When planning survey projects, budgets should allow for these additional follow-up surveys. We agree with S. Courtney and others (pers. comm.) that failure to detect murrelets on follow-up visits does not provide unequivocal evidence that murrelets were not actually present. When follow-up efforts fail to detect murrelets, proper evaluation of the original detection becomes even more important.

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- Ralph, C.J., S.K. Nelson, M.M. Shaughnessy, S.L. Miller, and T.E. Hamer. 1994. Methods for surveying for Marbled Murrelets in forests: a protocol for land management and research. Pacific Seabird Group, Redwood Sciences Laboratory, Arcata, CA.
- Roberson, D. 1990. North American bird records committees. *Birding* 22:276-285.
- John E. Hunter, USDA Forest Service, Six Rivers National Forest, 1330 Bayshore Way, Eureka, CA 95501.
- Ron LeValley, Mad River Biologists, P.O. Box 3020, McKinleyville, CA 95519.



# ARTICLE

## A Suggestion To Replace The Term "Staging Area" With "Gathering Ground" When Applied To Gatherings Of Seabirds Close To Their Colonies

The term "staging area" has been applied to areas at sea where seabirds, especially those that visit their colonies at night, for-gather to socialize during the breeding season (e.g. Sealy 1976, Drost and Lewis 1995). I would like to suggest that the use of this term be discontinued in this context, for two reasons: 1) "staging area" has for long been applied to areas where migrant birds routinely stop to feed during their transit between summer and winter quarters. This usage is much more common than its seabird application. It could be applied to areas used by seabirds on migration, although such areas are not usually sufficiently discrete to be so distinguished. 2) the word "staging" bears the connotation of being a stage on the journey from one place to another; a necessary halt between origin and destination.

The marine areas adjacent to colonies and used by seabirds for socializing are not equivalent to staging areas of migrants in that they are not necessarily used for rest and feeding and they do not necessarily constitute stepping stones from the feeding area to the colony, except in terms of time. In the case of the Ancient Murrelet (*Synthliboramphus antiquus*) and probably other alcids, they are used mainly for so-

cializing and not all of the birds present on a given day will visit the adjacent colony that night, or even that year. Nor will birds visiting the colony on a given night always pause on the sea before landing (Gaston 1992).

In order to distinguish socializing areas adjacent to seabird colonies from the staging areas of migrants, it seems desirable to have a separate term. Lockley (1942) used the term "assembly" for the gatherings of Manx Shearwaters (*Puffinus puffinus*) off their colonies, and Brooke (1990) used the modified (and perhaps tongue-in-cheek) "expectant assemblages," as well as the common "raft." However, these terms were applied to the actual flocks of birds, rather than the locality in which they assembled.

I have named those areas used by Ancient Murrelets in the breeding season for socializing in the early morning and evening, "gathering grounds" (Gaston 1992). The term "gathering," with its connotation of positive socialization, emphasises the fact that attendance at such areas has an important function in itself for courtship and display; birds are not simply in a holding area awaiting the onset of darkness. The term is self-explanatory and

hence unlikely to lead to confusion over meaning. I suggest that it be extended to cover all such social gathering areas used by seabirds during the breeding season (e.g. areas used by murres [*Uria* spp.], and puffins [*Fratercula* spp.] just offshore of their breeding sites).

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- Brooke, M. de L. 1990. The Manx Shearwater. T. and A.D. Poyser, London.
- Drost, C.A., And D.B. Lewis. 1995. Xantus' Murrelet (*Synthliboramphus hypoleucus*). In The Birds of North America, No. 164 (A. Poole and F. Gill, eds.). Acad. Nat. Sci., Philadelphia and American Ornithologists' Union, Washington, D.C.
- Gaston, A.J. 1992. The Ancient Murrelet. T. & A.D. Poyser, London.
- Lockley, R.M. 1942. Shearwaters. J.M. Dent, London
- Sealy, S.G. 1976. Biology of nesting Ancient Murrelets. Condor 78: 294-306.
- Anthony J. Gaston**, Canadian Wildlife Service, National Wildlife Research Centre, 100 Gamelin Blvd., Hull, Quebec, Canada K1A 0H3



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# PSG NEWS

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## PSG Served With Subpoena

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PSG has been served a subpoena in a law suit brought by Scott Timber Company against the federal government. The subpoena was served on Jan Hodder on April 8, 1996 in her capacity as an officer of PSG. It asks for all documents that PSG has in its possession related to Marbled Murrelets and their habitat. This is a first for PSG.

PSG is not a party to the law suit. PSG has only been asked to provide information that PSG may have in its possession that might affect the outcome of the litigation. When *Pacific Seabirds* went to press, PSG was in the process of responding to the subpoena and clarifying with the attorneys for Scott Timber Company which files should be searched. Several members of PSG's Executive Council and the Marbled Murrelet Technical Committee are cooperating in this effort.

Scott Timber Company, which operates in Oregon, filed suit against the USA in the U.S. Claims Court in Washington, D.C. This court has jurisdiction for claims of money damages against the USA. Apparently, Scott Timber Company asserts that it lost over \$9 million when several of its lease sales to log Forest Service lands were canceled after the Marbled Murrelet was listed as a threatened species.

This notice is to alert PSG members of this development, and to clarify that PSG has not been sued by Scott Timber Company. PSG will act in a professional and rational manner with regard to the subpoena.

*Craig S. Harrison*

## Japan Seabird Conservation

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Koji Ono and John Fries have been appointed as joint coordinators of the JSSC, replacing acting coordinator Harry Carter. Fries (who is conducting graduate work at the University of California Davis) has recently moved to Japan for the next two years with a visiting researcher scholarship from the government of Japan. He will join Ono at Toho University in Chiba Prefecture (near Tokyo) and both will be working in the lab of Dr. Hiroshi Hasegawa. Both Ono and Fries can be reached at: Laboratory for Marine Biology, Faculty of Science, Toho University (see Committee List for details). Ono can also be reached by email at the Japan Alcid Society ([kojiono@gol.com](mailto:kojiono@gol.com)).

A special symposium titled "International Seabird Forum 1996" will be held in Haboro-cho, Hokkaido, Japan, on 29-30 June 1996. Sponsors are the city government and Board of Education of Haboro-cho, with additional support from the Japan Environment Agency, Japan Wild Bird Society and several newspapers and television stations. This meeting will increase national and international awareness of Teuri Island and its seabirds, a Japanese national treasure and the world's largest Rhinoceros Auklet colony. On 29 June, invited speakers will give presentations on Teuri Island's seabirds (Yutaka Watanuki, Institute of Applied Zoology, Hokkaido University), interactions between man and seabirds (Haruo Ogi, Research Institute of North Pacific Fisheries, Hokkaido University), seabird conservation in Washington (Lora Leschner, Washington Department of Fish and Wildlife, past chair of PSG), seabird research in the Canadian arctic (Tony Gaston, Canadian Wildlife Service), and seabird restoration in Maine (Steve Kress, National Audubon Society). Following talks, participants will take the ferry to Teuri Island. On 30 June, a panel

discussion will be held on the island to address local and other methods of protecting seabirds at Teuri Island, including Nariko Oka (Yamashina Institute for Ornithology) and Takaki Terasawa (Teuri Island Nature Photographer). Several other PSG members also will attend, including Koji Ono, John Fries, Kuniko Otsuki, Kim and Will Nelson, and Tom Hamer.

Following this symposium from 1-6 July 1996, a group of researchers organized by the Japan Alcid Society (including Japanese researchers Koji Ono, Kuniko Otsuki, Yoshihiro Fukuda, Yasuhiro Kawasaki, Mihoko Sato, Takeo Akama and North American researchers John Fries, Tom Hamer, Kim and Will Nelson, Lora Leschner, and Tony Gaston) will leave for the Shiretoko Peninsula in northeastern Hokkaido, winter home of the Steller's Sea Eagle. This expedition will attempt to confirm breeding by the Asiatic Marbled Murrelet (*Brachyramphus marmoratus perdix*) in either old-growth forests or alpine areas which occur near the ocean in this area.

The Japan Alcid Society will be holding their annual meeting on 13 July 1996 at Toho University in Chiba Prefecture. Hiroshi Hasegawa (Toho University; active in seabird research and conservation in Japan, especially related to the Short-tailed Albatross on Torishima for over 20 years) and Tony Gaston (Canadian Wildlife Service) will conduct presentations of their work.

Much discussion has occurred about the scope of this committee and whether it should expand to cover other countries in eastern Asia. While the rapid advance in seabird research and conservation in Japan justifies a separate committee to focus on Japan, it is also important to expand efforts in other nearby countries. Malcolm Coulter has contributed significantly to these discussions.

*Harry R. Carter*, Past Acting Coordinator, The Japanese Seabird Conservation Committee

# 1997 ANNUAL MEETING IN PORTLAND, OREGON

## PACIFIC SEABIRD GROUP



## TWENTY-FOURTH ANNUAL MEETING PORTLAND, OREGON 8-12 JANUARY 1997

The 1997 Annual Meeting of the Pacific Seabird Group will be held at the Marriott Hotel in downtown Portland, the *Rose City*, from 8-12 January 1997. The meeting will include plenary and special paper sessions that focus on the health and ecology of the near-shore ecosystem (tentative title). A meeting announcement, with registration materials and a call for papers, will be mailed in early September 1996. Deadlines for abstracts and registration will be 1 October and 1 November 1996, respectively.

If you have any questions please contact:

### Local Committee Chairs:

*Dave Renwald*, Bureau of Indian Affairs, 911 NE 11th Ave., Portland, OR 97232 or *Martin Nugent*, Oregon Department of Fish and Wildlife, P.O. Box 59, Portland, OR 97207.

### Registration Chair:

*Tara Zimmerman*, U.S. Fish and Wildlife Service, 911 NE 11th Ave., Portland, OR 97232.

### Program Chair:

*S. Kim Nelson*, Oregon State University, Department of Fisheries and Wildlife, 104 Nash Hall, Corvallis, OR 97331.

### Daily Schedule

#### Wednesday 8 January

Preconference meetings - open to everyone  
Executive Council  
Marbled Murrelet Technical Committee  
Seabird Monitoring  
Other committees  
Welcome reception in evening

#### Thursday 9 January

Plenary session morning  
Paper sessions afternoon  
Evening reception

#### Friday 10 January

Paper sessions morning and afternoon  
Poster session evening

#### Saturday 11 January

Paper sessions morning  
Committee meetings in afternoon  
Executive Council  
Conservation Committee  
Other committees  
Business meeting  
Evening banquet

#### Sunday 12 January

Field trips morning and afternoon





## Martha Springer Retires As Editor Of Pacific Seabirds

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### Pacific Seabird Group



DEDICATED TO THE STUDY AND CONSERVATION OF PACIFIC SEABIRDS AND THEIR ENVIRONMENT

Ms. Martha Springer  
1708 Marmot Hill Road  
Fairbanks, Alaska 99709

2 April 1996

Dear Martha,

On behalf of the Elected Officers, Executive Council, and the whole of the membership of the Pacific Seabird Group, I would like to express our heartfelt thanks for your selfless service as Editor. Although your presence (in Fairbanks) has not been conspicuous to most, your hard work putting together the PSG Bulletin and Pacific Seabirds from 1992 through 1995 is obvious for all to peruse and appreciate.

In many respects, the job of Editor is one of the most difficult in the organization. Likewise, it is also clearly one of the most important. Less than half our membership typically attend annual meetings, but we all have received and read the product of your patient and dedicated efforts. Pacific Seabirds has grown and vastly improved under your stewardship. You have set the stage and standard for further growth and recognition for our annual publications. We hope you take great pride in your service and the professionalism you have lent to PSG. As with the work of any scientific editor, the legacy of your gift of precious time will last as part of our collective permanent record.

Passing the Editorial torch to Steve Speich will, without a doubt, take a while to complete. We hope you remain involved with PSG for a long time on whatever level your commitments will allow. I trust and hope that your experience as Editor was as enriching for you as it was for all of us.

With best regards and wishes,

A handwritten signature in dark ink, appearing to read 'William T. Everett', with a long horizontal flourish extending to the right.

William T. Everett, Chair  
Pacific Seabird Group

## Charles Joseph Guiguet: Recipient Of PSG Lifetime Achievement Award

On 11 November 1995 at the joint meeting of the Pacific Seabird Group (PSG) and the Colonial Waterbird Society (CWS) in Victoria, British Columbia (B.C.), Charles Joseph Guiguet was awarded the Lifetime Achievement Award by PSG. At the presentation, Guiguet's many achievements were summarized and a 1950 film called "Nature's Outpost - Triangle Island" was shown which captured Guiguet studying sea-

birds in the field. Guiguet was a pioneer vertebrate biologist in B.C. and served as biologist and curator of the Birds and Mammals Division at the B.C. Provincial Museum (BCPM; now the Royal B.C. Museum) from 1948-1980. His efforts to better determine the distribution of birds and mammals in B.C. led him to remote coastal areas where his collections and observations in the 1940s and 1950s led to the discovery and first insights into the vast populations of breeding seabirds in B.C., mostly hidden on isolated, forested islands shrouded in mist. He further conducted some of the earliest studies of the Marbled Murrelet, a seabird which nests in old-growth forests threatened by logging, and produced a widely-respected series of BCPM handbooks on the "Birds of B.C."

At the end of World War II in 1945, Guiguet (at age 30) returned to Vancouver, B.C., after distinguished service in Europe for the Canadian and Royal Air Forces. He returned to zoological studies at the University of British Columbia (UBC) where he had previously been associated with Professor Ian McTaggart-Cowan. In 1948, he was hired as a biologist by the BCPM in Victoria, B.C. Efforts to study birds and mammals had waned at the BCPM during the war, and



Charles J. Guiguet (PSG Lifetime Achievement Award recipient, right) and Mark J. Rauzon (PSG Chair), Victoria, B.C., 11 November 1995. Photo by John N. Fries

since McTaggart-Cowan's departure from the BCPM to UBC in 1940. Guiguet was to build the bird and mammal collections and expand the knowledge of the vertebrate fauna of B.C., beyond the then recent "Review of the Bird Fauna of British Columbia" by Munro and Cowan (1947). In 1946-1947, 1952 and 1959, he travelled to the remote Queen Charlotte Islands, at times with his wife Muriel or McTaggart-Cowan, to collect island-endemic birds and mammals for the UBC and BCPM collections. He became well acquainted with naturalist Ronald Stewart at Massett. In 1948-1949, he travelled to the desolate Goose Islands, off the north mainland coast, where he completed his UBC Master's studies (Guiguet 1953) and worked closely with biologist Pat Martin. In 1949-1950, Guiguet travelled with BCPM biologists G. Clifford Carl, George Hardy, and Frank Beebe to investigate the Scott Island Group, including Triangle Island off the northwestern tip of Vancouver Island (Carl et al. 1951).

In these and other coastal areas, often alone and with little support, Guiguet spent much time discovering and investigating the extensive populations of seabirds breeding on remote B.C. islands which we now know hold most of the world's Ancient Murrelets, Cassin's

Auklets and Rhinoceros Auklets. His collections and field notes were used extensively in the "Catalogue of British Columbia Sea-bird Colonies" by Drent and Guiguet (1961). While UBC Professor Rudy Drent and his students were conducting detailed studies of seabirds at Mandarte Island and other nearby Gulf Islands, information for the rest of the province's vast coasts

was available almost entirely from the widely-traveled Guiguet. For many islands and species, Guiguet had noted either the first nesting in the province or provided the first verification and description of nesting since early records by egg collectors at the turn of the century (Guiguet 1950a, 1971; Drent and Guiguet 1961; Campbell et al. 1990). The "Catalogue" was the forerunner of large-scale efforts since the 1960s to document and monitor seabird colonies in B.C. and along the Pacific coast from Alaska to California. Guiguet's notes also have been used extensively by Campbell et al. (1990) and Rodway (1991) in their summations of the known history of seabird colonies in B.C.

Guiguet also became enthralled with the little known Marbled Murrelet during collecting trips in the Queen Charlotte Islands and he observed these mysterious birds throughout B.C. coastal waters and flying inland over forested areas. He also collated data from other observers to produce several important articles, including a famous one titled "The Enigma of the Pacific" (Guiguet 1956). In these articles, he provided many clues for future researchers to discover inland nesting in old-growth forests, including observations of nests, eggs collected from oviducts,



and discoveries of downy young and fledglings at inland localities. In retrospect, Guiguet reported the first tree nest of a Marbled Murrelet in the world, based on the discovery by Walter Feyer of an adult and broken eggshells in a felled hemlock near Masset in 1953. Guiguet's observations and papers were instrumental in the original deductions that Marbled Murrelets nest primarily in old-growth forests (Guiguet 1950b, 1971, Sealy and Carter 1984). This assertion has fueled the recent (since the late 1980s) onslaught of research on Marbled Murrelets to fully demonstrate this fact and to congeal our concerns about the effects of logging on this species all along the Pacific coast from Alaska to California.

From 1954-1983, Guiguet produced a series of 10 BCPM handbooks on the birds of B.C. In addition, he co-authored the extensive and well-known handbook on the "Mammals of B.C." with McTaggart-Cowan (Cowan and Guiguet 1956). Together, these handbooks provided a more complete coverage of the natural history and distribution of seabirds (Guiguet 1957, 1972), waterfowl (Guiguet 1958), shorebirds (Guiguet 1955) and other birds (see citations in Campbell et al. 1990), based in his own intimate understanding of wildlife from decades of collecting and observing. Even today, these handbooks are used widely by both birdwatchers and experienced researchers, often providing important data on little known aspects of natural history. For many decades, these handbooks filled the gap between Munro and Cowan (1947) and Campbell et al. (1990), other large summaries of information on birds in B.C.

In 1969, Guiguet oversaw the transition of the Birds and Mammals Division of the B.C. Provincial Museum from the cramped quarters in the east wing of the Parliament Buildings to their current structure and site next door. He hired many biologists, including R. Wayne Campbell (later the lead author for the recent amazing compendium on the "Birds of B.C." [Campbell et al. 1990]), and oversaw the expanded division during the 1970s which conducted many expeditions to better understand the bird and mammal fauna of B.C., including the first

complete surveys of seabird colonies in B.C. in 1975-1977. He strongly influenced the lives and careers of many colleagues and budding biologists during his tenure. Guiguet retired in 1980 and, with wife Muriel and their extended family, leads an active life in Victoria. The Guiguets are well known for their fishing prowess. Charles' classic wooden boat *The Pride of the Fleet*, which had a commercial license for many years, still plies the waters of Oak Bay as it has for over 45 years.

Space constraints prevent a complete description of this remarkable individual's life and overall contributions to the knowledge of birds and mammals in B.C. Refer to Campbell et al. (1990) for a recent citation list for Guiguet's many publications. Mortimore (1954) provides other important details on Guiguet's life. This brief summary on his contributions related to seabirds has benefitted from the comments and efforts of R.W. Campbell, M. Lambert, I. McTaggart-Cowan, and E. Taylor. Charles and Muriel Guiguet provided many important details.

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## Canada

### Pacific Coast

The Wildlife Chair at Simon Fraser University (**Fred Cooke** and **Doug Bertram**), continues to be very active, with the third field season at Triangle Island already underway. **Hugh Knechtel** is running the camp this year, as well as working on an M.Sc. involving relating chick growth strategies/patterns in Cassin's Auklets to phenotypic variation in adults (eg. adult body size) and measures of parental quality using 'conventional' quality measures (eg. mass, structural size) and 'novel' methods (eg. blood parameters, parasite load). He will also be looking at potential covariation between parental provisioning ability and quality per se using cross-fostering. He will also examine molt-breeding overlap of Cassin's Auklet parents and its consequences for chick growth. The usual work on banding of Rhinoceros Auklets and Tufted Puffins will continue and **Julia Parish** will continue observing murre reproductive success and behaviour. In parallel with this study, **Anne Harfenist** of the Canadian Wildlife Service will continue work on the demography of Cassin's Auklets at Frederick Island and the **Laskeek Bay Conservation Society** will also monitor Cassin's Auklets at Reef pairs).

**Gary Kaiser** completed the planned eradication of rats from Langara Island last fall and we were ready to declare a victory. However, in February, a follow-up team found evidence of further rat activity in the area of the Ancient Murrelet colony. A team including **Anne**, **Gary** and **John Elliot** from the C.W.S. office in Delta will return to the island in April, hopefully to complete the job. Elsewhere in Haida Gwaii (Queen Charlotte Islands), the monitoring and control of raccoons continues, with the involvement of Parks Canada, the Canadian Wildlife Service and the B.C. Parks Service. Last September, **Anne Harfenist** and others visited Helgesen Island and shot all but one of the resident

raccoons. A party equipped with raccoon dogs was scheduled to visit the island in March, and we hope that they can remove any remaining raccoons. This colony of Rhinoceros Auklets, Cassin's Auklets and Ancient Murrelets was reduced by about 80% between 1986 and 1993. We hope that a sustained campaign against the raccoons will halt these declines. **Tony Gaston**, CWS and the **Laskeek Bay Conservation Society** found no evidence of raccoons on East Limestone island this spring and we are hoping for another raccoon-free season at that much-diminished colony.

Activities relating to Marbled Murrelets continue in British Columbia. A long-term collaborative research project on Marbled Murrelets continues in Desolation Sound, B.C. in 1996. **Gary Kaiser** (CWS), **Fred Cooke**, **Tony Williams**, **Doug Bertram**, **Wendy Beauchamp** (Simon Fraser University/CWS Cooperative Wildlife Research Chair) and **Kathy Martin** (CWS/UBC) are coordinating studies of population demography and genetics, reproductive physiology and marine and nesting habitat use. Two SFU graduate students are also involved: **Irene Manley**, an M.Sc. student with **Alton Harestad**, will continue a study of nesting habitat selection and **Cecilia Betancourt-Lougheed**, co-supervised by **Fred Cooke** and **Doug Bertram**, will begin an M.Sc. project on marine habitat use and movement patterns of murrelets. In 1995, 198 Marbled Murrelets were captured and 8 nests were found in high elevation old-growth. Since 1991, 398 individuals in this population have been banded. Aerial telemetry of radio-tagged birds to locate nests and track movements of individuals will continue in 1996. **Gary Kaiser** will establish a study site in the Queen Charlotte Islands and begin an intensive capture and banding project. This will allow future comparisons of a population from an area where habitat is less fragmented by forestry to a population in Desolation Sound where logging has been more intense.

**Alan Burger**, Biology Dept. University of Victoria will continue to study seabird distribution over the continental shelf off southwestern Vancouver in 1996, com-

paring densities and species composition with physical and biological oceanic features. Marine transects to census Marbled Murrelets will continue year-round in Barkley Sound, and through the breeding season along the West Coast Trail. Over 2000 Marbled Murrelets have been regularly recorded along this 66 km stretch of open coast in the past two years. Long-term monitoring of inland activities of Marbled Murrelets continues in the Carmanah-Walbran watersheds adjacent to this coast. In a collaborative project with **Trudy Chatwin** (BC Ministry of Environment, Lands and Parks) we will use radar, along with the standard Marbled Murrelet protocol to inventory Marbled Murrelets in a range of watersheds in Clayoquot Sound. **Gail Davoren** (M.Sc.) will be doing her second season of research on Rhinoceros Auklets at and around the Seabird Rocks colony. The project involves comparing feeding rates and meal sizes at the colony with adult activities and distribution at sea, in order to assess the effects of variable prey distribution on breeding success and parental time budgets. **Michelle Masselink** is starting a M.Sc. project on the impacts of Steller's Jays as potential predators of Marbled Murrelets on southwestern Vancouver Island.

### Atlantic And Arctic Coasts

The CWS Seabird Committee met at Quebec City on 11-12 March 1996 to consider several issues related to seabird conservation in Canada. Although the committee is small and has no decision-making powers it provides advice to senior CWS management. It has achieved a few modest successes, most notably, last year, in persuading the government to prevent the development of a hotel resort on Bird Rocks, an important seabird colony in the Gulf of St. Lawrence. **Gilles Chapdelaine** reported on Razorbill conservation in the Gulf of St. Lawrence; public awareness initiatives and the results of banding. The population is currently expanding, but hunting in Newfoundland remains a threat (Razorbills are shot in mistake for murres, which can be legally hunted and continued close monitoring is essential). Further



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banding at colonies in Labrador would be desirable. Recently, a seabird community monitoring project has been undertaken in the Gulf of St. Lawrence: four study sites have been selected, and species of interest will be Double-crested Cormorants, terns, large gulls and Razorbills. Diet, chick-growth and population size will be monitored. **John Chardine** presented the proof of a brochure being produced to educate murre hunters about razorbills, particularly how to distinguish between them and murres. He also reported on seabird breeding performance in Newfoundland: reduced breeding success of Black-legged Kittiwakes in recent years appears to be due to: i) heavy predation of eggs by Herring and Great Black-backed Gulls; ii) loss of synchrony between kittiwake hatching and capelin arrival; and iii) changes in the Atlantic ecosystem, resulting in smaller capelin that are distributed differently. On the bright side, murres and puffins have been doing well in Newfoundland in recent years.

**Grant Gilchrist**, now employed as a seabird biologist in Yellowknife, NWT, talked about gull research in NWT. Most research in the new territory of Nunavut, where Inuit form a majority, seems likely to be directed at important food species, especially eiders, but some work on gulls will be undertaken to monitor important populations (e.g. Sabine's Gull, Thayer's Gull, Kumlien's Gull, Ivory Gull). **Grant** will also continue studies of Glaucous Gull populations and behaviour at Coats Island, in conjunction with **Tony Gaston's** Thick-billed Murre project.

The Cooperative Wildlife Chair at Simon Fraser University now has its counterpart on the east coast in the form of ACWERN (Atlantic Cooperative Wildlife Ecology Research Network). Both the senior chair, **Tony Diamond** (University of New Brunswick) and the junior chair, **Ian Jones**, (at Memorial University, Newfoundland) have several projects on seabirds, of which the most important is Ian's plan to open up a multi-species study on auks at Gannet Islands, Labrador. This will begin in May and will involve **Mark Hipfner** (ex-Coats Island, who will continue studies of egg formation and chick growth in auks). The initial intention of the programme is to evaluate changes that have

occurred since the work done by **Tim Birkhead** and **David Nettleship** in the early 1980s. is proposing, and how they may tie in with CWS programs and objectives (handout available upon request).

**Tony Gaston** recently evaluated the results of monitoring Thick-billed Murres at colonies in the Eastern Canadian Arctic. This study suggests that the colonies at Prince Leopold Island and Coats Island have increased slightly over the past two decades, while that at Digges Island has remained stable. Information is still very fragmentary, despite a lot of effort. **Tony Lock** discussed where should we be going with the offshore seabird distribution database initiated by **Dick Brown** in the 1960s. The data has now been made available for use on PCs and can be output in a variety of ways. **Tony** hopes to expand the use of this valuable resource. **Birgit Braune** talked about the results of toxic chemical monitoring in seabirds to date. Surveys of several species in the Arctic in 1993 showed that, while DDT levels have fallen since the 1970s (not surprisingly), PCBs have not.

## Northern California

The second annual California Seabird Research Coordination Workshop was held on 24 January 1996 at the offices of the Gulf of the Farallones National Marine Sanctuary (GNFMS) in San Francisco. The workshop was hosted by the GNFMS and chaired by **Bill Sydesman** (PRBO) and **Jan Roletto** (GNFMS). The workshop, initiated in 1995 in an effort to keep seabird biologists apprised of each other's research, was attended by twenty-six biologists from throughout the state. Topics of discussion included extensive population monitoring (regional surveys); intensive population monitoring (demographics); at-sea and beached bird surveys; threatened, endangered and candidate species; physical and chemical pollutants; and restoration projects. A summary of the meeting (pertaining to research conducted in northern and central California) follows below.

### Extensive Population Monitoring: Re-

### gional Surveys

#### Coastal

**Harry Carter** (NBS) reported that funding for aerial censuses of seabird colonies conducted by USFWS/NBS has ended and no money exists for analysis photos from previous years. However, **Mike Parker** and colleagues (USFWS/SFBNWR) will continue aerial surveys of Common Murre and Brandt's Cormorant colonies in northern and central California utilizing funds provided by the Apex Houston settlement. Negotiations are currently underway to have PRBO provide correction factors (for the COMU censuses) from Southeast Farallon Island (SEFI), as they have done in previous years. In addition, USFWS/SFBNWR will develop correction factors from nearshore colonies at Point Reyes National Seashore and along the Big Sur coast. **Mike Bonnell** (UCSC) pointed out the existence of a large database from the 1970's containing over 25,000 aerial photographs of colonies from Oregon to Mexico.

Censuses of burrow nesting seabirds in central and northern California are currently limited to Año Nuevo Island and S.E. Farallon Island (PRBO). **Don Croll** (USCS) observed that these species are often neglected in region-wide surveys.

A discussion regarding the cross-calibration of aerial and boat surveys for Marbled Murrelets took place. The consensus was that cross-calibration is necessary, however funding for this type of work is limited. **David Ainley** (H.T. Harvey and Associates) suggested that the Office of Oil Spill Prevention and Response (OSPR - CDFG) provide funding for cross-calibration research. **Paul Kelly** (OSPR) responded that a collaborative venture would be possible, but they could probably not provide the funding alone.

The issue of establishing aerial survey buffer zones in order to prevent disturbance to seabird colonies was raised. **Sarah Allen** (NPS) suggested that PSG develop guidelines for surveys, however most everyone agreed that due to variability in response from colony to colony, a standard could not be set. The importance of not disturbing seabird colonies during any surveying was agreed upon.



**Mike Bonnell** and **Paul Kelly** pointed out that seabird and marine mammal surveys should be coordinated.

#### *Estuarine*

Research on estuarine species in northern and central California is currently conducted by the San Francisco Bay Bird Observatory, Golden Gate National Recreation Area (GGNRA), U.C. Davis, Elkhorn Slough, Moss Landing Marine Laboratories (MLML), H.T. Harvey and Associates, PRBO, and various Audubon groups. The major threats to estuarine species continue to be predation and pollution, and more research on the effects of these factors is needed.

#### *Inland*

Aerial surveys of Ring-billed and California Gull colonies in California and Nevada have been conducted by **Dave Shuford** (PRBO) and **Harry Carter**. In general, population monitoring of inland seabird colonies suffers from a lack of funding and interest. It was noted that inland colonies have been subject to greater impacts than marine colonies; unfortunately, little information exists on historical populations. **Mike Fry** (UCD) observed that herons are seriously impacted by agricultural contamination. **Bill Everett** (PSG) noted that a heron management plan has been developed for San Diego and could be applied to other areas.

#### **Intensive Population Monitoring: Demographics**

#### *Southeast Farallon Island*

**Bill Sydeman** (PRBO) reported that long-term monitoring of the population and breeding biology of twelve species of seabirds continues on SEFI. He noted that one of the largest gaps in our understanding of seabird population dynamics is the lack of knowledge regarding adult and juvenile survival.

#### *Alcatraz Island*

**Daphne Hatch** (NPS) reported that Brandt's and Pelagic Cormorants, Western Gulls, Pigeon Guillemots, Black Oystercatchers, and Black-crowned Night Herons all breed on Alcatraz Island. Reproductive success of these species is followed as is possible. She noted that

each year there are 800,000 visitors to the island, thus management issues are under constant assessment.

#### *Point Reyes National Seashore*

**Sarah Allen** reported that four shipwrecks, one of which resulted in an oil spill, occurred within the Seashore boundaries in 1995. In the course of rescuing the skipper of one of the vessels, a U.S. Coast Guard helicopter flushed murres off of four colonies on the headlands (in June). As a result, one of the colonies experienced complete reproductive failure and productivity of the other three colonies was significantly impacted. PRBO was contracted by the Seashore to assess the effects of the wreck on the four murre colonies and will continue to monitor reproductive success at these colonies in 1996. The National Park Service is currently working with the CDFG Commission to establish flight restrictions over the Seashore, however if implemented, these restrictions will not apply to the Coast Guard during rescue operations. **Bill Everett** brought up the possibility of PSG providing restriction guidelines to the FAA.

#### *Northern California*

**Harry Carter** noted that **Deborah Jaques** and **Craig Strong** (Crescent Coastal Research) are interested in monitoring burrow and crevice nesting seabirds on Castle Rock. In general though, there is little seabird research conducted in northern California (with the exception of Marbled Murrelets).

#### **At-Sea and Beached Bird Surveys**

#### *Central California*

**Jan Roletto** currently oversees the Beach Watch volunteer program for GFNMS. All accessible beaches from Bodega Head to Año Nuevo are censused every four weeks. GFNMS also hopes to begin at-sea surveys within the Sanctuary sometime this year. Other agencies conducting beached bird surveys include: MLML, PRBO, OSPR, and NBS (as needed). A need to coordinate beached bird programs and databases was expressed.

H.T. Harvey and Associates and

PRBO will be conducting surveys of marine birds at dump sites for dredge spoils originating from San Francisco Bay. These surveys, funded by the Army Corps of Engineers and the EPA, will compare species composition and abundance within and outside of the dump zones. **David Ainley** and **Larry Spear** (H.T. Harvey and Assoc.) are currently investigating how species characteristics (e.g. flight speed, color, size) affect variability of observation during at-sea surveys. They are continuing their work on the development of techniques to estimate seabird population size from at-sea surveys, particularly for species that are difficult to census from land. They are refining their technique by cross-calibrating at-sea population estimates of Common Murres and Western Gulls with breeding populations from colonies within the Gulf of the Farallones.

#### *Monterey Bay*

**Don Croll** (UCSC) and colleagues are currently investigating predator/prey relationships in Monterey Bay, specifically, how predator distribution, abundance, and body size relates to prey patch distribution and abundance. He noted that UCSC hosts a Marine Acoustic Workshop each year.

**Bill Everett** commented that oceanographic information for Monterey Bay is currently available on the Internet at: <http://www.nws.mbay.net/home.html>. Oceanographic information can also be obtained by performing an Internet search on NEMO (Scripps Institution of Oceanography) and REINAS (met stations).

MLML continues to monitor Caspian Terns in Elkhorn Slough.

#### **Threatened, Endangered and Candidate Species**

#### *Marbled Murrelet*

Studies of Marbled Murrelets will continue in 1996 in Big Basin State Park, Año Nuevo Bay, and in northern California. CDFG and others have identified a need for prey studies to elucidate reasons for low productivity of this species.

**Tom Hamer** has replaced **Nancy Naslund** as the chair of the PSG Marbled Murrelet Technical Committee.

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### *California Least Tern*

Funding for research on this species is apparently low, however not much information was available at the time of the workshop.

### *Brown Pelican*

PSG and others have recommended down-listing the Brown Pelican from endangered to threatened species status. It was noted that discussions about delisting the species completely have taken place, and there appears to be political pressure to do so. **Frank Gress** (UCD) commented that at present, only the breeding colonies on Anacapa and Santa Barbara Islands are regularly impacted by human disturbance.

### *Ashy Storm-Petrel*

**Bill Sydeman** stated that mark/recapture studies of Ashy Storm-Petrels on SEFI indicate that the population has decreased by approximately 40% from 6,500 in the early 1970's to a current level of 4,500. Ashy Storm-Petrels are predated upon on SEFI by Western Gulls, Burrowing Owls, Peregrine Falcons, and mice (eggs). A discussion of the difficulties associated with producing accurate population size data from mark/recapture studies ensued. **David Ainley** suggested using at-sea survey data to derive population estimates for this species.

### Physical and Chemical Pollutants

#### *Chronic Oil Pollution*

PRBO continues to collect information on chronic oiling of seabirds. In addition to data collected on SEFI over the past 25 years, a chronic oil database maintained by the U.S. Coast Guard has been released to OSPR, and will also be examined.

#### *Contaminants*

Research conducted by **Mike Fry** and researchers at MLML has revealed that the reproductive failure of the Caspian Tern colony in Elkhorn Slough in 1995 was the result of exposure to DDE, PCBs and Toxaphene. Heavy rains during the winter of 1995 produced extensive runoff which is believed to have remobilized contaminants in the ecosystem.

**Mike Fry** and **Scott Newman** (UCD) also found elevated levels of PCBs in murres that had washed up on beaches during the summer of 1995.

**Mike Fry** noted that high levels of DDE were once present in eggs of Ashy Storm-Petrels and recommended investigating current levels for this species. **Bob Hosea** (CDFG - Pesticides Unit) offered the use of his laboratory for contaminants analyses.

**Bill Sydeman** reported that studies undertaken by PRBO/GFNMS on contaminant levels in fish, marine birds, and mammals of the Gulf of the Farallones are now complete. Common Murres showed the highest levels of PCBs and DDE, Pigeon Guillemots showed elevated levels of mercury. Overall contaminant levels in Brandt's Cormorants and Rhinoceros Auklets were low.

#### *Rehabilitation Research*

**Scott Newman** will be conducting a final season of field work this year for his research (funded by OSPR) on determining baseline blood parameters of marine birds. He is still in need of blood samples from Common Murres, Pigeon Guillemots, Pelagic Cormorants, Brandt's Cormorants, Rhinoceros Auklets and Marbled Murrelets.

#### *Gillnets*

The CDFG gillnet observer program has ended, however gillnets continue to cause mortality in seabirds. **Harry Carter** reported that gillnets currently capture approximately 100 birds per boat per year, levels that may be affecting populations of certain species.

### Restoration Projects

#### *Common Murre*

**Mike Parker** (USFWS) reported that USFWS/SFBNWR, in conjunction with **Steve Kress** (NAS), and **Harry Carter** (NBS) deployed murre decoys, mirrors and sound equipment on Devil's Slide Rock in early January as part of a restoration project funded by the Apex Houston settlement. Within 48 hours of deployment, four Common Murres (live ones) were observed on the rock, and a copulation was observed two weeks later. To

date, murres have been present on Devil's Slide Rock almost daily, and the current high count is 17. Behavioral observations are conducted daily, and murre colonies at Point Reyes headlands, SEFI (in conjunction with PRBO), and along the Big Sur coastline will be utilized as reference sites.

#### *Rhinoceros Auklet*

The Año Nuevo Rhinoceros Auklet restoration project, initiated by PRBO in 1993, is now in its fourth year. **Michelle Hester** (PRBO) reported that 61% of the nest boxes are utilized by breeding pairs. Productivity of natural burrows is also monitored through the use of a remote video camera system which can document the presence of eggs and chicks. Cassin's Auklets, Brandt's Cormorants and a single pair of Heerman's Gulls were found to be breeding on the island during the 1995 season.

### Other Seabird News

#### *PSG Monitoring Database*

Both PRBO and Simon Fraser University will receive funding from PSG to enter their respective long-term monitoring databases into the PSG monitoring database.

#### *1997 California Seabird Research Coordination Workshop*

The 1997 California Seabird Research Coordination Workshop will be hosted by U.C. Davis and chaired by **Mike Fry**. The October issue of Pacific Seabirds will contain a more thorough summary of seabird research conducted in northern and central California.

#### *Elizabeth McLaren*

## Southern California

**Pat Baird** is continuing a four-year study on the foraging ecology and food habits of California least terns in the San Diego area (with four of her students) in a study supported by the U.S. Navy. One of her students, **Todd Carpenter**, is studying the population dynamics of black footed



Black-footed Albatrosses on Tern Island (Hawaiian Islands) for the U.S.F.W.S. under **Mark Webber**.

**Lisa Ballance** is continuing her studies on community ecology of seabirds in the tropical Pacific Ocean with **Bob Pitman**. They also spent five months in the tropical Indian Ocean last year to compare feeding and community ecology between these two oceanic systems.

**Charlie Collins** is still supervising research on California Least Terns in southern and northern California, and monitoring nest success at colonies from San Diego to the San Francisco Bay area.

**Bill Everett** continues to do work on the ecology of seabirds on the Coronado Islands and on Snowy Plovers on the Channel Islands. He recently saw **Craig Harrison** on a short trip back East where they attended a meeting of the American Bird Conservancy (formerly Bird Life International formerly International Council of Bird Preservation ICBP). He is busy as usual as Chair and is also commuting a lot with family to various places in the West because of different and diverse schedules.

**Gene Fowler** is teaching at Pomona College and was able to get time off to go down to Chile and Argentina to look for new sites of Humboldt Penguin colonies in Chile and Magellanic penguin colonies in Argentina. In a new study, he will be looking at the influence of human disturbance (especially ecotourism) on levels of penguins' stress hormones for birds living on islands in a saltwater estuary, each island having a different history of human visitation. (One island is where some mutinous crewmen were hanged by Ferdinand Magellan and where others were beheaded by Sir Francis Drake; and, incidentally also where Magellanic Penguins were named).

**Judith Hand** is working with the fundraising committee for PSG, trying to bring the endowment fund to completion. She has e-mailed to members of the EC some good boilerplate-type letters to help solicit funds from corporations, foundations, etc. She is eagerly awaiting a new brochure/flyer to include in her letters.

**Michael Horn** is analyzing data from the 1995 breeding season on diets of terns and skimmers in Bolsa Chica (Huntington

Beach, CA) and the western Saltworks in San Diego. He will go back this breeding season to collect more data in a study sponsored by the USFWS. He is very busy supervising four students this year. Two of his students, **Jacquelyn Wilson** and **Wendy Loeffler** will be publishing their theses in a few months. **Jacquelyn** looked at diel activity patterns and diet in Black Skimmers at Bolsa Chica, and **Wendy** looked at diets and resource partitioning in terns (Caspian, Elegant, Forsters) and skimmers which nest at Bolsa Chica. Two other students, **Kristin Chavez**, studying assimilation efficiency of tern chicks (Caspian, Elegant) in the lab to try to determine if this rate limits how often they get fed; and **Patricia Cole**, looking at provisioning of prey to chicks of Caspian and elegant terns; are both beginning research for their theses this summer.

**George Hunt** is in the process of working up data from the western Aleutinas gathered last summer and in 1992 and 1993. He has two students analyzing prey availability in the area. Graduate student **Jen Zamon** is finishing up analyses on mixed species foraging flocks in San Juan and Lopez Islands and looking at factors that may influence seasonal and vertical distribution of herring and sand lance. Students **Libby Logerwell**, looking at rates of movements of fish and their prey, and **Sasha Kaitaysky** working with **John Piatt** in lower Cook Inlet, are both finishing up their dissertation work. **Kyra Mills** is finishing her Master's degree work on Galapagos Penguin foraging. **Cheryl Baduini** is a new student who will be going to Tern Island (Hawaiian Islands) to study chick provisioning in wedge-tailed shearwaters.

**Kathy Keane** started her own consulting firm is enjoying the combination of research and managing one's own business. She is working still at San Elijo Lagoon on a least tern restoration project. Last year two artificial islands were built and used for nesting by the terns. This year, the project is building two more islands in hopes that they will be used too. She recently studied behavior of brown pelicans on the San Pedro (CA) breakwater.

**Libby Logerwell**, a graduate student of **George Hunt**, is comparing the rates of movement of fish and their prey for her dissertation.

**Paige Martin** is still at Channel Islands National Park, analyzing population and breeding biology of cormorants on Santa Barbara Island and studying eared owls recently found nesting there.

**Pat Mock** just completed a three-year study on the distribution and abundance of water birds in San Diego Bay, and is starting a programmatic review of Point Mugu's environmental operations, looking at both seabirds and marine mammals. He is finishing up a regional plan of San Diego County, looking at the ecology of multiple species for the Natural Communities Conservation Planning (NCCP) process. He just finished the assessment for base closure and realignment of El Toro and Tustin Air Stations to Camp Pendleton and Mira Mar. He is also publishing like crazy, having just submitted five manuscripts to the Proceedings of the California Gnatcatcher Symposium. His second child arrived last July. He is currently on jury duty on a boring trial so that his trip to Knotts Berry Farm in July is looking exciting. **Pat** is proud to announce that he finally got in final payments for PSG life membership last year!

**Mark Pierson** is still involved in a study of distribution and abundance of shorebirds in Ventura County. He is trying to target which beaches are most important for shorebirds because the many forces of development are clamoring to redesign the last remaining "wild" beaches in Southern California which are not on military land. He will be doing a cooperative study with a specialist in soft substrates, sampling for prey species. He is also conducting a study in cooperation with UC Santa Cruz on oil spill prevention and response in a study funded by CDF&G. He and others are flying aerial surveys monthly in the Santa Barbara channel and Santa Maria basin (north of Point Conception) for coastal and marine birds during 8 months of the year, concentrating their effort during the migratory months. The purpose of the study is to provide baseline data for near-shore divers, deep water alcid and other

seabirds, as well as marine mammals in order to update data from 15 years ago.

**Stu Warter** is still teaching vertebrate zoology and marine ornithology at California State University Long Beach. His graduate student **Mike Autch** is working on aggressive interactions in wintering western sandpipers.

**Walter Wehtje** is attending UC Riverside in a Ph.D. program under **Tom Scott**. He is currently working on land birds, looking at their breeding abundance and dispersion on San Nicholas Island. He is especially interested in juvenile dispersal patterns. He married **Morgan Boucke** (California Department of Fish and Game) a year ago.

**Paula White** is currently skydiving as well as working.

**Eric Woehler** is at present in Tasmania Australia.

*Pat Baird*

## Washington And Oregon

### Washington

Seabird biologists in Washington State convened on 7 March 1996, for the first annual Washington Ad Hoc Seabird Group meeting. The Ad Hoc Group and meeting were modeled loosely after similar congregations in California and British Columbia. The meeting was hosted by the University of Washington (**Julia Parrish**) and the Washington Department of Fisheries and Wildlife. The morning agenda focused on greetings and self-introductions with each attendee providing their background and information about on-going seabird work. The afternoon session included a general discussion of issues related to seabird work in Washington. In total, 40 people attended the meeting, an impressive turnout for the first year.

The group came up with three general lists which might be used as a starting framework for future group discussions: 1) general reasons to work on seabirds in Washington State (or why seabird information is valuable); 2) current programs

or projects on Washington seabirds; 3) and current priorities and needs including continuing efforts and gaps to be filled.

The lists are neither complete nor prioritized; however, they do give a sense of the important issues facing seabirds in Washington State, as well as ongoing attempts by many parties to address those needs.

At the conclusion of the meeting, it was decided that the group should meet again next year. **Ken Warheit** volunteered to take over the meeting logistics. **Ken** is assembling a list of all parties working on or interested in seabirds in Washington State, their species and areas of interest, and types of data they most need to augment or compliment their work. That list is currently in progress and anyone interested in participating can contact **Julia Parrish** for handouts, etc. from this year meeting, or **Ken Warheit** for next year's meeting.

Attendees of the meeting and their areas of interest / research is as follows. **Julia Parrish**, University of Washington (UW), is working with Common Murres on Tatoosh Island studying behavioral ecology and conservation biology. **Doug Meekins**, Hamer Environmental, is working with Marbled Murrelets and survey protocols. **Bill Ritchie** and **Eric Cummins**, Washington Department of Fish and Wildlife (WDFW) Diversity Division, will be coordinating conservation oriented Marbled Murrelet forest surveys, with WDFW Regional support, at 12 to 15 sites in western Washington. **Bill** will also be monitoring nesting behavior and collecting nest structural data at any new nests that are discovered. **John Grettenberger**, U.S. Fish and Wildlife Service (USFWS) Endangered Species Program is working with Marbled Murrelets, and permit actions involving seabird-gillnet interactions. **Ken Warheit** (WDFW) Oil and Toxics/Spills Division. Is involved with Natural Resource Damage Assessment (NRDA) and seabirds restoration activities. In particular, he is involved in Nestucca and Tenyo Maru restorations. **Ed Melvin**, Washington Sea Grant is interested in seabird by-catch in gillnets and is conducting gear modification studies. **Monique Wilson**, WDFW, is investigating seabird food

habits using carcasses from gillnet mortality studies. **Chris Thompson**, WDFW, is conducting at-sea seabird surveys on outer coast. **Joe Galusha**, Walla Walla College, is studying socio-ecology of Glaucous-winged Gulls on Protection Island.

**Ulrich Wilson**, USFWS is studying Rhinoceros Auklets on Protection, Smith, and Destruction Islands, and is conducting outer coast colony surveys of Common Murres and cormorants. **Dave Stokes**, (UW). Has been studying penguins in Argentina and is currently interested in intermixing of tern and gull populations between eastern and western Washington. **Trista Patterson** (UW) is studying pair-bonding in Fork-tailed Storm-Petrels. **Jean Takekawa**, USFWS is a recent immigrant from California, interested in seabird conservation issues.

**Louise Vincencio**, USFWS is interested in population monitoring in estuaries including Gray Harbor and Nisqually. She has also been involved in the Nestucca Oil Spill Restoration program. **Laura Leschner**, WDFW, has been conducting marine surveys of seabirds for the Puget Sound Ambient Monitoring Program (PSAMP).

**Jeff Momot**, USFWS - Environmental Contaminants, continues to be involved with the Nestucca and Tenyo Maru oil spill restoration plan work. **David Nysewander**, **Joe Evenson**, **Warren Michaelis**, and **Bryan Murphie**, WDFW, are conducting censuses on all marine bird species in Puget Sound as part of PSAMP. Their censuses, conducted by boat and aerial surveys, place special emphasis on the 1) diving ducks (includes primarily sea and bay ducks), 2) diving seabirds (alcids and cormorants), 3) other diving species (grebes and loons), 4) wintering shorebirds, and 5) species of special concern like harlequin duck and marbled murrelet.

**Mary Mahaffy**, USFWS, has been working on coastal watershed issues, contaminant monitoring as part of PSAMP, and is involved with the Tenyo Maru oil spill restoration process. **Sievert Rohwer**, Curator of Birds at Burke Museum of Natural History (UW) reports that Burke has largest collection of North



Pacific seabirds in the world and wants to encourage research use of their collection. **Jon Anderson**, WDFW, Salmon Management, is involved in Puget Sound non-treaty fisheries and seabird by-catch in gillnets. **Ed Bowlby**, Research Coordinator, Olympic Coast National Marine Sanctuary has been trying to provide platforms of opportunity for research in the Sanctuary including their vessel "Tatoosh".

**Paul Crawford**, Natural Resource Manager of Olympic Peninsula National Park is interested in oil spill response and damage assessment. **Mary Carlson**, Bird Biologist at the Seattle Aquarium is working with captive alcids and is interested in facilitating researcher interactions with the aquarium. **Ann Edwards**, (UW) is researching community ecology of seabirds and interactions between seabirds and the marine environment. **Denise Dailey**, Fisheries Management for the Makah Tribe, is interested in population studies on seabirds and marine mammals and is involved with the Tenyo Maru Oil Spill restoration program. **Suzanne Romain**, (UW) will be working with Common Murres on Triangle Island. B.C.. **Darlene DeGhetto**, HOWL Veterinarian is interested in increasing contacts with researchers regarding rehabilitation and release of injured birds.

**Will Beattie**, Northwest Indian Fisheries Commission is a Section 7 Consultant on gillnet impacts and marine surveys to measure seasonal change of Marbled Murrelets. **Karen Jensen**, (UW), is interested in population biology and conservation of Common Murres, Marbled Murrelets, and penguins.

**Richard Rowlett**, Field Naturalist, is interested in population surveys and coastal seabird migration in California. **Terrence Wahl**, Field Naturalist, will be continuing at-sea seabird surveys adding to the 30 years of data he has collected off Westport, WA. **Terry and Steven Speich** are planning to revise and re-issue the Washington Seabird Colony Catalog. **Dee Boersma**, (UW) is studying environmental variation, population dynamics, conservation biology of seabirds.

**Jeff Skriletz**, WDFW, is assisting **Terry Wahl** on boat surveys of gillnet fishery by-catch. **Scott Edward**, Curator

of Genetic Resources, Burke Museum of Natural History, (UW) has various interest in seabirds including population and metapopulation dynamics. **Dick Viet**, (UW) is studying foraging behavior of seabirds searching for patchy resources and is interested in population dynamics of oceanic seabirds affected by climate change. **John Pierce**, WDFW, Wildlife Research Program, is interested in facilitating high quality science, which can be translated into management policy. **David Jennings** Audubon Society, is involved with fishery issues, gillnet by-catch, Magnuson Act re-authorization, and is concerned about the need for a better understanding of seabird population biology for Washington State resident and migratory seabirds. **Dave Manuwal** (UW) has studied seabirds since 1969 with particular interest in alcid biology. He is currently working on a Common Murre manuscript with **Harry Carter**, **Jean Takekawa**, **Ulrich Wilson**, **Bill Sydeman** and **Roy Lowe**. **Alix Foster**, Seattle Audubon and UW Law School is interested in seabird by-catch, competition with fisheries, impacts of plastics.

Other seabird activities occurring in Washington and not reported on at the Ad Hoc Group meeting include **Don Williamson** (USFWS), who has been working on NEPA documentation for proposed Spartina control actions to protect estuarine habitat on Willapa National Wildlife Refuge. **Don** will be conducting an aerial photo survey of cormorant nesting colonies at Cape Disappointment in June.

**Donald Norman** is now on the Board of Directors of Adopt-A-Beach in Seattle, which has coordinated a beached bird survey for many years, and currently has over 7 beaches being monitored by volunteers. Data collected in the past is being computerized, by **Bonnie Dickson**, who can be reached at (206) 624-6013, or at PO Box 21486 Seattle, WA 98111-3486. Adopt a Beach is always interested in cooperating with any agencies or researchers, and would enjoy receiving any updates on the procedures or data being collected by other beach walkers. Adopt a Beach is also involved in monitoring PSP, Spartina removal, and has worked on monitoring bird/ net entanglement.

The Washington State Department of Natural Resources (DNR) is continuing a series of Marbled Murrelet forest habitat relationships studies in support of its forest management programs. These studies address 1.4 million acres of forest trust lands in six planning units within the murrelet's Washington range.

Results will be used to develop an effective long-term murrelet conservation strategy.

Each planning unit has 54 survey areas, between 20 and 100 acres, on Washington forest trust lands. These areas are stratified by two factors, (1) distance from marine waters and (2) habitat quality, based on stand age and number of platforms per acre. Each area is surveyed four to ten times a year for two consecutive years, according to the PSG forest survey protocol. The murrelet habitat in each survey area is characterized from three to four 25.2 meter radius vegetation plots. Physical variables collected include location, elevation, aspect, and slope. Biological variables collected include understory vegetation; canopy cover; tree species, age, height, and diameter; number and type of platforms; moss and lichen coverage; and mistletoe broom abundance, among others.

Habitat relationships studies were initiated in 1994 in the North Coast and South Coast planning units. In 1995, studies were completed in these planning units. Also in 1995, studies were initiated in the Strait of Juan de Fuca and Columbia River planning units. In 1996, work will be finished in these two planning units. New work is scheduled to begin in the North Puget Sound and South Puget Sound planning units in 1997 and 1998, respectively.

**Danielle M. Prenzlów and Lenny S. Young** Washington Department of Natural Resources Resource Planning and Asset Management Division P.O. Box 47014, Olympia, WA 98501-47014. (360) 902-1600, FAX: 902-1789 e-mail: dpll490@wadnr.gov

## Oregon

**Jan Hodder** and students at the Oregon Institute of Marine Biology will be continuing their study of the nesting success of Pelagic Cormorants at the OIMB col-



only in Sunset Bay at Cape Arago. This is the 25th consecutive year this colony has been studied. **Dr. Patrick Jodice** working through the Forest and Rangeland Ecosystem Center of the National Biological Service (NBS) and the Department of Fisheries and Wildlife at Oregon State University (OSU), I will be continuing my radio-telemetry work with Marbled Murrelets along the Oregon Coast. He will begin capturing birds in early May and will concentrate efforts from Coos Bay to Lincoln City. Birds will be tracked inland and at sea. He also will be conducting inland surveys, as he did in 1995, to collect data to be used in determining the feasibility of using inland surveys to detect changes in numbers of detections at a site over time. **S. Kim Nelson**, Oregon Cooperative Wildlife Research Unit at OSU, will be continuing research on Marbled Murrelet habitat associations on state lands in Oregon in 1996. Plans for this year are similar to 1995 and include using tree climbing to locate nests in mature and old-growth forests on the Tillamook and Elliott State Forests. Objectives are to: characterize murrelet nesting habitat on state lands by describing nest and non-nest plots, monitor active nests for success and failure, and describe the characteristics of successful nests.

**Roy Lowe** and **David Pitkin**, USFWS, will be continuing annual seabird monitoring projects in Oregon in 1996. Activities include aerial photographic censuses of Common Murre and Brandt's and Double-crested cormorant colonies. They will also continue monitoring nesting attempts by Pelagic Cormorants at 17 colonies near Newport. A beached bird mortality study on 7.1 km of beach located between Seal Rock and Alsea Bay in Lincoln County will continue from June through September.

This is the 10th consecutive year of this study. An aerial survey of Brown Pelicans along the Oregon and Washington coasts is planned for mid-September if funding permits. Fall-spring monitoring of Aleutian Canada Goose use of Oregon coastal rocks and islands is also continuing. An investigation initiated by **Ted Buerger**, **Roy Lowe**, and **David Pitkin**, USFWS, in 1995 to assess the possible

role of environmental contaminants in the yearly die-off of juvenile and adult common murre along the Oregon coast continues. A reference sample of 20 live murre 10 adults and 10 juveniles was collected in July 1995, and blood samples were obtained from 16 of these birds immediately following collection. Ten of these murre were sent to the National Wildlife Health Center (NWHC), Madison, Wisconsin, for necropsy and tissue collection. The remaining 10 birds were necropsied at the time of collection and tissues retained for residue analyses.

Twenty dead or moribund murre subsequently were collected during the typical die-off period and submitted to the NWHC. Tissue samples from all murre have been submitted to the appropriate laboratories. Brain, kidney, and liver are being analyzed for organochlorines (including total PCBs), cadmium, and trace elements, respectively. The findings of the necropsies performed by the NWHC are unremarkable; the most noteworthy observation is that 17 of 20 dead or moribund murre were emaciated. Reports on the reference murre necropsied at the time of collection and the analyses of blood samples are in preparation.

Given the negative findings to date, detailed analysis of tissue residue data may help elucidate possible causes of the annual common murre die-off. Review and analysis of necropsy, tissue residue, and blood parameter data is continuing.

**Jeremy Buck**, USFWS, is continuing to serve as lead biologist on a study of organochlorines in Double-crested Cormorants nesting on Lewis and Clark National Wildlife Refuge on the lower Columbia River. Fish and wildlife within the Columbia River are exposed to a variety of environmental contaminants through municipal and industrial permitted discharges, urban and industrial non-point pollution, accidental spills of oil and hazardous materials, and agricultural runoff. Elevated levels of some organochlorine pesticides (including DDT and DDE), polychlorinated biphenyls (PCBs), dioxins, and furans have been found in numerous fish and fish-eating species inhabiting the river. Since 1990, the USFWS has been collecting eggs of Dou-

ble-crested Cormorants nesting on islands on Lewis and Clark National Wildlife Refuge. In 1993, eggs were also collected from a reference colony on Hunters Island off the southern coast of Oregon.

Thirty-two eggs were collected from 1990 to 1991 and 40 eggs were collected from 1993 to 1995 for analysis of organochlorine contaminant residues and to measure the enzyme-inducing capability of egg tissue using the H4IIE rat hepatoma cell bioassay. Preliminary results showed DDE and total PCB concentrations were low and relatively similar among the colonies. However, the concentration of the most potent dioxin congener was higher in eggs from the Lewis and Clark colonies than from the reference colony. In addition, the cell bioassay indicated that concentration of dioxin-like compounds in the Lewis and Clark colonies would relate to a 23% egg mortality rate when compared to cormorants nesting in the Great Lakes. Further comparisons of organochlorine contaminants, with emphasis on specific PCB, dioxin, and furan congeners, will be conducted when all analytical and bioassay results are received in 1996.

**Robert Pitman**, with the assistance of **Roy Lowe** and **David Pitkin**, is continuing a long term study of the reproductive biology of Leach's Storm-Petrels on Saddle Rock, Oregon. Banding of storm-petrels was initiated here in 1979 and has continued annually. To date a total of 7,475 birds has been banded, including 3,773 adults and 3,702 chicks. There have also been 214 recaptures.

**Robert Loeffel** and **Don & Sara Brown** are continuing their long-term, year-round beached bird mortality study on 7.4 km of beach just south of Newport in Lincoln County. This study is now in the 19th consecutive year. **Asa C. Thoresen** has completed a book manuscript on Auks of the World that includes over 600 references on auks. The book is not published but interested individuals can receive a copy on disk (Macintosh) by writing Asa at 885 Eckman Ct., McMinnville, OR 97128 or E-mail [thoresena@spessart.com](mailto:thoresena@spessart.com).

*Roy W. Lowe*

## Non-Pacific United States

In the Massachusetts-Connecticut-New York area, **Jeffrey Spendelow** continues coordinating the Cooperative Long-term Roseate Tern Metapopulation Project, a comprehensive population dynamics and ecological study. Since his last report, **Jeff** and co-investigators have published papers on a variety of topics including (1) colony-site differences in responses of adults to trapping, (2) variations in growth of chicks, (3) a new method for sexing adults, (4) estimating colorband loss rates, and (5) estimating annual survival and movement rates of adults. These workers hope that methods and models developed for the last publication will be used widely in future studies of other species. Beginning in 1996, they plan to quantify consequences of the female-biased sex ratio among breeders, to develop models for examining age- and sex-specific parameters, and to integrate results of foraging and feeding studies of known-age adults with population dynamics data. By the end of 1996, they also hope to update their preliminary analyses of postfledging survival, natal-site fidelity, dispersal, and recruitment. To request a product list for the Metapopulation Project, send an e-mail to "Jeff\_Spendelow@NBS.gov".

At the University of Nevada, Reno, **Margaret Rubega** will conduct year two of a multi-year interdisciplinary study of salt tolerance in hatchling American Avocets and Black-necked Stilts. The work is aimed at understanding all the components of salt tolerance in shorebirds breeding in saline wetlands, and wetlands salinized by water diversions and irrigated agriculture. **Chris Elphick** just finished his final field season on the effects of winter-flooding in California rice fields on birds. The study involves experimental tests of the effects of different management treatments on bird communities, comparisons of shorebird and egret behavior among habitats, and analyses of the effects of surrounding landscape features on bird abundance.

At the Beltsville Agricultural Research Center in Maryland, **Eric Hoberg's** research focuses on historical and ecological determinants of biodiversity of parasite faunas of marine birds, mainly in the holarctic. Studies of holarctic and world fauna include: (1) host-parasite cospeciation among alcids and their parasites; (2) biodiversity of the acanthocephalan fauna of marine birds in the North Pacific basin; (3) and the systematics, phylogeny, historical biogeography, and coevolution of tapeworms among Sphenisciformes, Procellariiformes, Pelecaniformes, and Charadriiformes.

In Wyoming, several studies of American White Pelicans have recently been published:

**Diem, K. L., and B. H. Pugesek.** 1994. American White Pelicans at the Molly Islands, in Yellowstone National Park: twenty-two years of boom-and-bust breeding, 1966-87. *Colon. Waterbirds* 17:130-145.

**Findholt, S. L., and S. H. Anderson.** 1995. Foraging areas and feeding habitat selection of American White Pelicans (*Pelecanus erythrorhynchos*) nesting at Pathfinder Reservoir. *Colon. Waterbirds* 18:47-57.

**Findholt, S. L., and S. H. Anderson.** 1995. Diet and prey use patterns of the American White Pelican (*Pelecanus erythrorhynchos*) nesting at Pathfinder Reservoir, Wyoming. *Colonial Waterbirds* 18:58-68.

Also in Wyoming, **Andy Hart, Sheryl Hill, and Jim Lovvorn** are beginning a project that integrates field measurements of production, stable isotope studies, and simulation models of foodweb networks to understand effects of salinity on foodwebs leading to birds in High Plains lakes. **Paul Kaseloo** is beginning studies of how "waste" heat from exercising muscles and specific dynamic action is used by diving ducks to reduce costs of thermoregulation while foraging in cold water. **Jim Lovvorn** continues work with **Matthias Borstad and Geoff Liggins** in the Mechanical Engineering Department at the University of British Columbia on the biomechanics of swimming in a wide variety of diving birds.

**Jim Lovvorn**

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# BOOK REVIEWS

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## Marbled Murrelet Conservation Assessment

**Ecology and Conservation of the Marbled Murrelet.** C. John Ralph, George L. Hunt, Jr., Martin G. Raphael, and John F. Piatt, eds. 1995. General Technical Report PSW-GTR-152. Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture, Albany, California. viii + 420 pp., many text figures. Free copies have been distributed on request by the Pacific Southwest Research Station, P. O. Box 245, Berkeley, California 94701-0245.

This large volume of 37 chapters is a product of more than 40 authors and provides a broad perspective up into 1994 on the biology and prospects for conservation of Marbled Murrelet (*Brachyramphus marmoratus*) in North America. In less than 30 years human interest in this species has dramatically changed. As recently as the early 1970s the Marbled Murrelet remained in many respects one of the least studied of all North American breeding birds, but, as a result of publicity in recent years, the species now commands attention throughout the continent and beyond. Although naturalists had long suspected that these birds were nesting in old growth forests in the Pacific Northwest, confirmation by actually finding a nest in a tree did not come until 1974. Even 20 years later, despite substantial efforts in the interim by highly qualified biologists, knowledge of the these murrelets, though greatly expanded, remains less complete than would be desirable. A valuable feature of this volume is assessment of previous investigations in relation to desirable directions for future studies.

As a diving seabird that can nest many meters off the ground in a large tree many kilometers from the ocean, the Marbled Murrelet has a combination of ecological specializations that are exceptional in

comparison with other birds of the world. If special efforts towards conservation are to be directed to species on the basis of unusual features in their biology, then the Marbled Murrelet should be a prime candidate for attention. Understanding this species continues to require exceptional effort on the part of both forest biologists and marine biologists, and in this book with its major sections on the terrestrial and marine environments points out the important connections. Although much publicity about murrelets has concerned the reduction in forests suitable for nesting, this volume illustrates that human activity in the marine environment, such as oil spills and gill-netting, can also adversely affect murrelets. The book indicates the importance of learning much more about the causes and effects of fluctuations in abundance of food for these birds.

This well edited volume remains close to its subject of the Marbled Murrelet, and one will not find digressions on the heated controversies about the lumbering of old growth forests or the future of the Northern Spotted Owl. Readers seeking a more comprehensive view of related conservation issues in the region from northern California to Alaska will need to consult additional sources. The book contains 21 pages of references listed in double columns, but these citations include many unpublished items that will not be readily accessible to most readers. Although hundreds of references are listed, many do not specifically concern Marbled Murrelets but are pertinent either for illustrating interpretative methods that can be applied to murrelet biology or for comparison with other seabird species.

This book will be essential for biologists and others concerned with Marbled Murrelets and other alcids. Specialists with primary interests in other groups of seabirds also may find the book useful. Libraries with extensive holdings in ornithology, marine biology, forestry, or conservation should have a copy. The authors and editors are to be congratulated for this useful contribution.

George A. Clark, Jr., Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269-3043.

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## Birdlife Conference Seabirds, Islands, Threats, Studies and Plans

**Seabirds on Islands: Threats, Case Studies and Action Plans.** Nettleship, D. N., J. Burger and M. Gochfield, eds. 1994. Birdlife Conservation Series Number 1. Birdlife International, Cambridge, UK. Pp. 318. ISBN 1-56098-525-7. \$32 USD.

This book contains the Proceedings of the Seabird Specialist Workshop held in November 1990 at the 20. World Conference of the ICBP (the old International Council for Bird Preservation, now renamed Birdlife International) in New Zealand, just proceeding the 20th International Ornithological Congress. The book consists of an introduction, a conclusions chapter and 19 papers. Three of these deal with threats, 11 with major seabird problems, and five with action plans, progress, and solutions.

Among the threats, I.C.T. Nisbet gives an excellent summary of the effects of petroleum products; of chlorinated hydrocarbons, mainly as industrial wastes; of plastic particles and other artifacts; and also of biological agents such as harmful microbial blooms, though these latter are poorly studied and understood. Indirect, mostly negative effects are caused by increase of such competitors and predators as gulls and skuas. He calls attention to the potentially substantial effects of the predicted global climatic changes.

The seabird—fishery interaction areas are as old as marine fishery itself. The potential dangers to marine birds and/or the fishermen's catch are masterly treated by D.C. Duffy and D.C. Schneider. This



is a serious review paper (with extensive use of the literature) that every seabird student should read. J. Burger and M. Gochfield summarize and evaluate the threats posed by humans and their introduced commensals on nesting seabirds. These latter, the alien predators (rats, mice, cats, mongoose, pigs, etc.) are considered as the major threat. Humans are seen as keystone predators influencing the numbers of other predators. They are a major cause of seabird losses by disturbing, and changing the nesting environment in seabird habitats.

The papers about special cases deal with island problems in various parts of the world, from the high arctic Svalbard Archipelago to Ascension Island on the Equator, and to the Chatham Islands way down in the South Pacific. We mention two more from the Pacific area. W. Hsu and D. S. Melville's concise account is especially welcome as it brings us up to date from Melville's earlier report (1984, in Croxall et al. ICBP Techn. Publ. 2.). it gives both the good and bad news about seabird conservation in China and at the China Sea, further tabulates and maps the data of all seabirds, among these, the recently discovered breeding grounds of *Larus saundersi* and the Chinese breeding grounds of *L. relictus*. F. Velarde and D. W. Anderson give a complete, albeit concise, monographic account of

the geography, geology and biogeography of the Sea of Cortez (Gulf of California) and the peninsula of Baja California that encloses this unique Gulf of the Pacific Ocean. It harbors 14 species of pelagic seabirds, several of which are regional relicts, or have 60 to 100 % of their world population confined to these desert islands. Here again, recent developments are both good and bad. Major problems are overfishing of the sardines, increased tourism and introduction of alien predators; conservation and management efforts are laudable but enforcement and education of the public are most important in the developing conservation plans.

We can learn much from the last group of papers, dealing with action plans and their implementations on Christmas island (Indian Ocean), the Seychelles, the Galapagos, the Cape Verde islands. The last paper, about the outstanding success of seabird protection and education of the local people on the North Shore of the Gulf of St. Lawrence in Canada's North Atlantic, leaves us with an optimistic note. This, in spite of D. C. Duffy's concluding pages, who's message is "save what is left of the world's dwindling seabird populations." Reading Duffy's concrete suggestions is a must for all seabird researchers, because study and conserva-

tion are inevitably linked together amidst the increasing multitude of humans that swarms to, and threatens seabirds around the islands and coasts of the world.

*Miklos D.F. Udvardy, Department of Biological Sciences, California State University, Sacramento 95819.*

## New Literature

Love, J.A. 1994. Penguins. Whittet Books, London. 128 pp. ISBN 1-873580-16-9.

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# ABSTRACTS

## Twenty-Third Annual Meeting Of The Pacific Seabird Group - A Joint Conference With The Colonial Waterbird Society - Victoria, British Columbia, 8-12 November 1995

### RESOURCE PARTITIONING BETWEEN GLOSSY AND WHITE IBISES IN A RICE FIELD SYSTEM OF SOUTH-CENTRAL CUBA

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Population density, foraging microhabitat and diet composition were analyzed for the American White Ibis (*Eudocimus albus*) and the Glossy Ibis (*Plegadis falcinellus*) while feeding in the ricefield system of "Sur del Jibaro" (Sancti Spiritus, Cuba) from May to December. Population density for *E. albus* ranged from 2.2 ind/ha in May to 23.2 ind/ha in October, and for *P. falcinellus* from 1.4 ind/ha in August to 217 ind/ha in October. Both ibises shared the same main foraging microhabitats, except in October when, coinciding with their highest population densities, they segregated their foraging grounds. In this month the White Ibis tended to forage mainly in recently muddied up fields where, owing to the action of the machinery, many crabs and aquatic insects are available; while Glossy Ibises tended to concentrate in flooded fields with mature ears shedding their grains. A general account of diet shows that both species also segregate on diet composition: the White Ibis feeds on crabs (59%), aquatic insects (20%) and fishes (18%), whereas the Glossy Ibis feeds on rice grains (53%), aquatic insects (25%) and crabs (21%). A quantitative assessment on granivorous feeding habits of the Glossy Ibis is reported for the first time.

### DISPERSAL PATTERNS AND GENETIC STRUCTURING OF SEABIRD COLONIES

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Dispersal and recruitment are key processes in population dynamics of colonial organisms, yet are difficult to study directly in free-ranging animals. Increasingly, genetic methods are being used to infer dispersal patterns. While these avenues are promising, it is essential to understand the restrictions and biases inherent in any new scientific method. Here I present results of a case study of dispersal and recruitment in Thick-billed Murres (*Uria lomvia*). Spatially explicit, individual-based simulation models are used to explore the population-genetic consequences, in terms of degree of 'clustering' of genotypes, of different dispersal behaviors. Natal dispersal is modeled using two parameters, representing: a) degree of philopatry, and b) distribution of dispersal distances. Both isolation-by-distance and island patterns of gene flow are considered. To address methodological aspects, simulated colonies are sampled in ways analogous to those used in recent field studies, and Gst statistics, commonly used to quantify population genetic structure, estimated. Preliminary results suggest poor correspondence between dispersal parameters and Gst estimates from field data. Gst sampling errors are large compared with errors due to uncertainty in dispersal parameters, and distributions of Gst estimates depend heavily on sampling design. Standardized sampling methodologies may aid interpretation and comparisons of empirical results.

### LONG-TERM POPULATION CHANGE OF MARINE BIRDS IN PRINCE WILLIAM SOUND, ALASKA

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Small boat surveys of Prince William Sound were conducted during July of 1972, 1984-85 (shoreline only), 1989, 1990, 1991, and 1993. Data from these surveys indicate that populations of several species of marine birds and mammals that prey on fish have declined in Prince William Sound over time, but species that feed on benthic invertebrates have not declined. Marbled Murrelets, Pigeon Guillemots, Arctic Terns, Black-legged Kittiwakes, Glaucous-winged Gulls, Tufted Puffins, and Harbor Seals feed on schooling forage fish and have declined by >50%. Benthic invertebrate harvesters, such as Harlequin Ducks, Goldeneyes, Black Oystercatchers, and Sea Otters, have not declined within Prince William Sound, although the populations of some species were affected by the Exxon Valdez oil spill. These declines in piscivorous species suggest that changes in the forage fish community distribution, abundance, or composition have occurred over the last 20 years.

### SEASONAL AND SPATIAL VARIATION IN THE DIET OF CASSIN'S AUKLET REVEALS OCCURRENCE PATTERNS OF COASTAL EUPHAUSIIDS OFF CALIFORNIA

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We investigated spatial and temporal variation in the diet of a planktivore, the Cassin's Auklet *Ptychoramphus aleuticus*, in the Gulf of the Farallones, California, a population that has decreased in size consistent with the general decline of zooplankton in the California Current. Stomach samples were collected annually



during the non-upwelling-, post spring transition- (to upwelling-), and the midst of the upwelling-periods, 1985-88. Auklets fed on the small, energetically inferior, oceanic euphausiid, *Euphausia pacifica*, during non-upwelling periods, but following the spring transition, they switched first to small, juvenile fish (mostly *Sebastes* spp.) until these had grown too large for capture. Thereafter, auklets fed on the larger, energetically more valuable euphausiid, *Thysanoessa spinifera*, which had become seasonally available. The pattern was repeated annually, with some within-year variability among ancillary prey. Foraging locality, however, varied only slightly. Results indicate the value of studies of certain, easily accessible predators, which can temporally and spatially integrate prevalence of prey species to thereby better understand the important processes that structure marine food webs.

#### MODELING MARINE HABITATS OF SEABIRDS WITH A GEOGRAPHIC INFORMATION SYSTEM

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Policy makers, resource managers, and scientists universally recognize that most monitoring programs are unable to adequately detect change in many species of the marine environment. To this end, we designed predictive models of seabird distribution and abundance using a geographic information system (GIS). Models were based on the results of logistic and multiple regression analyses of environmental data collected at sea during May-June, 1985-1991. GIS digital data layers contained in the models included depth, sea-surface temperature, distance from the nearest species-specific colony, distance from the shelf-break, and distance from land. We tested model accuracy with a "error matrix" using data collected in 1992. Overall, the models performed well for abundant species such as Common Murre and Cassin's Auklet but poorly for species that occur in low abundance. We applied the results of the predictive models to coastal issues such as

the location of shipping lanes and the placement of dredge spoil disposal sites. Spatial analysis can generate insights into species habitat associations which are not possible to discern from the usual statistical analyses.

#### HABITAT ASSOCIATIONS OF NESTING SPECTACLED EIDERS ON THE NORTH SLOPE OF ALASKA

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Since 1992, we have studied nesting Spectacled Eiders and their habitats at several locations on the North Slope of Alaska, including the Colville River Delta and North Slope oilfields. In the Kuparuk Oilfield, we found 69% of all nests ( $n=45$ ) in basin wetland complexes (drained-lake basins), a complex habitat that includes waterbodies with stands of emergents, and intricate shorelines with numerous islands and peninsulas. Other habitats used for nesting were the margins of Carex ponds, *Arctophila fulva* ponds, shallow ponds without emergents, and deep open lakes. In all habitats, nests usually were located near the water (mean = 5 m to the closest waterbody). On the Colville River Delta, although we did find some (25% of 24 nests) Spectacled Eider nesting in basin wetland complexes, nests were found more often near shallow ponds with polygonized margins (42%). Other habitats used for nesting on the Colville River delta included Carex and *Arctophila* ponds, and deep open lakes with polygonized margins. As in the oilfields, most nests were located close to water (mean = 1 m). We also will discuss nesting habitats of King Eiders in the region.

#### FEEDING ECOLOGY OF SEABIRD FLOCKS IN THE TROPICAL PACIFIC: COMPETITION AND ENERGETIC CONSTRAINT OPERATING AT OPPOSITE ENDS OF A PRODUCTIVITY GRADIENT

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We investigated the ecology of seabirds that feed in flocks in association with sub-surface predators in the tropical Pacific. Our data were collected throughout a 10 year time period and a 40 million km<sup>2</sup> area. Multivariate analyses revealed that these flocks can be classified into three flock types based on species composition. Flock types were significantly different with respect to size and species diversity and each flock type showed a distinct distribution that was significantly correlated with surface water productivity. We hypothesize that this guild of seabirds is largely structured by two factors which operate at opposite ends of a productivity gradient. As productivity increases, competitive ability becomes more important and competitively superior species will exclude others from feeding flocks. As productivity decreases, flight proficiency becomes more important and those species with relatively high flight costs will be excluded from feeding flocks. Our hypotheses were supported in that species differed in body size and therefore, competitive ability, as well as energetic cost of flight according to the predictions.

#### WATER LEVELS, HYDROPATTERNS, AND THE DISTRIBUTION OF GREAT EGRETS AND WHITE IBISES IN THE WATER CONSERVATION AREAS OF THE EVERGLADES, FLORIDA

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Aerial surveys were used to quantify the distribution of Great Egrets and White Ibises within the 3,600 km<sup>2</sup> Water Conservation Areas. Classification analysis was used to characterize the hydrologic condition during each survey into one of four categories: wet, intermediate, dry, and extra dry. The spatial distribution of Great Egrets and White Ibises shifted in response to changing hydropatterns suggesting that water depth was the primary factor influencing distribution. Comparison of estimated water depth with Great Egret and White Ibis distribution showed that birds avoided marshes with deep water and those with little or no water, and selected marshes with intermediate water

depths. A computer model was developed to test whether Great Egret and White Ibis distributions could be predicted solely upon water depth. Comparisons of the expected distributions with the observed distributions suggest that water depth was a good predictor of Great Egret distribution but was not a good predictor of White Ibis distribution. White Ibis were more clumped across the available water depths. Factors other than water depth seem to influence where White Ibis were found foraging.

#### DISTRIBUTION AND BEHAVIOUR OF SURF SCOTER IN THE SAINT LAWRENCE RIVER ESTUARY IN SUMMER AND FALL

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We quantified Surf Scoter distribution and behaviour at staging and moulting sites in the Saint Lawrence estuary from mid-August to mid-October. Surf Scoters were unevenly distributed and occurred in groups of 50 to 3,000 birds. Important areas for scoters included the tidal and subtidal flats around Patte de Lièvre Island near Forestville, between the archipel of Kamouraska and Les Pèlerins near Saint-André de Kamouraska, and around the archipel of Les Rasades near Cap à L'aigle. Daily time budget of scoters varied between areas and date. Overall, scoters spent 41% of their time feeding. Tide had seemingly more impact on time budgets than did time of the day. Feeding tended to concentrate on rising and falling tide, whereas swimming and resting were more prevalent at high tides although patterns were highly variable. Flock dispersion varied between areas, with individuals in tighter flocks at Patte de Lièvre Island than Cap à L'aigle and most dispersed at Saint-André. Diving times were similar at Patte de Lièvre Island and Cap à L'aigle but averaged longer at Saint-André. Synchronized diving was most frequent at Patte de Lièvre Island. Flock size and foraging substrate differ-

ences between sites may account for some of the differences.

#### FISH CROW INVASION OF A COLONIAL WATERBIRD ROOST

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For the past eighteen years the sundown fly-in at a colonial waterbird night roost in Rookery Bay Sanctuary, has been monitored bi-weekly. In nineteen eighty five a few Fish Crows (*Corvus ossifragus*) started coming in and roosting for the night. Since that time they have come in continually and increased their population to a mean of 875. There are definite seasonal fluctuations ranging from the means of 342 in May to 1469 in January. Nine species of colonial waterbirds roost on the 0.75ha. Red Mangrove (*Rhizophora mangle*) island in the middle of Rookery Bay, Collier County, Florida (26°01'N 81°44'W), six of the species nest. The numbers of colonial waterbirds using the island range from the means of 1054 in May to 2622 in August. Although the crows roost in large numbers, no discernible effect has been recorded on the birds using the island and the numbers of all of the colonial waterbirds have increased slowly over the years.

#### ECOLOGICAL SUCCESSION AND HABITAT CREATION FOR COLONIAL WATERBIRDS IN HAMILTON HARBOUR, ONTARIO

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Colonial waterbirds have colonized 3 artificial mainland sites and 3 islands (2 artificial, 1 natural) in Hamilton Harbour in western Lake Ontario. Since 1985, Double-crested Cormorants, Black-crowned Night-Herons, Ring-billed Gulls,

Herring Gulls, Caspian and Common Terns have nested regularly, with occasional nesting by Snowy Egrets and Great Black-backed Gulls. Hamilton Harbour has become one of the most important nesting areas on the Great Lakes. Ecological succession and inter-species competition for nesting habitat is monitored for both ground-nesting and tree-nesting species. Most birds now nest on the Eastport Development Area, where harbour facilities are under construction. Three wildlife islands are being constructed to provide new nesting habitat for the colonial waterbirds that are being displaced from Eastport. Rapid colonization of these 3 islands is expected but a management plan is needed to maintain the habitat, monitor its use and coordinate gull and cormorant control if needed.

#### REPRODUCTION OF BLACK-CROWNED NIGHT-HERONS RELATED TO PREDATION AND CONTAMINANTS

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Reproductive characteristics were studied at five colonies of Black-crowned Night-Herons (*Nycticorax nycticorax*) in south central Washington (4) and north central Oregon (1) in 1991. Predation (primarily avian) was a major factor that adversely affected reproductive success in three colonies and was relatively unimportant in two colonies. The mean number of young surviving to 14 days of age in each colony ranged from 0.47 to 1.94 per nesting female (includes recycling efforts). Unadjusted nest success at each colony ranged from 31 to 84% (including recycling efforts). Clutch size and incidence of recycling also varied markedly by colony. Residues of DDE, total PCBs, and related compounds were relatively low in most eggs, and mean eggshell thinning by colony ranged from 7 to 11%.



Cytochrome P-450 enzyme (EROD, PROD, and BROD) induction in livers of pipped embryos by colony ranged from low to average in comparison with other colonies throughout the U.S. Residues of dioxins (TCDD) and furans (TCDF) in eggs were generally low and apparently had little influence on reproductive success at any of the colonies.

THE RELATIONSHIP BETWEEN WINTERING AREA AND BREEDING SITE IN THE GREATER FLAMINGO  
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In the western palearctic, greater flamingos nest in a few localities, although they largely disperse during the non-breeding season. During the last ten years, only two breeding sites have been regularly occupied, the Camargue in southern France and Fuente de Piedra in southern Spain. We analyzed resightings of birds ringed in the Camargue during the winter period and during the following breeding season. The probability to nest in Spain or in France was largely affected by the presence of the bird in the same area during the previous winter. We discuss the effects of sex, age and cohort on the selection of breeding site in flamingos.

ADOPTION IN RING-BILLED GULLS: CAN FOSTER PARENTS BENEFIT?

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From 1990-94, we investigated the proximate and ultimate causes of adoption in ring-billed gulls. Of the 54 chicks that abandoned their natal broods, 38 were permanently adopted and 16 were runners (remained in recipient broods <3 days). Chicks that departed their natal brood were growing at a lower rate than chicks that survived to fledge in their home brood ( $P < 0.05$ ), and third-hatched chicks were more likely to depart than their older siblings ( $0.1 > P > 0.05$ ). In cases where the relative ages of chicks were known, adoptees were usually older (24 of 30) than their foster brood mates and so realized a survival advantage (19 of 24 fledged) at the expense of their foster sib-

lings (15 of 35 fledged). Foreign chicks that were younger than their foster siblings realized poor survival (1 of 12 fledged). While parents that were successful at having a chick adopted also benefited (+0.4 chicks fledged/pair), reciprocal altruism was an unlikely explanation because the breeding costs to the actor (-0.5 chicks/pair) outweighed the benefits to the recipient. However, natal philopatry (10 banded chicks have since returned to this colony as breeders; all male) and nest site tenacity could lead to the formation of kin groups. DNA fingerprinting will show whether or not adopting pairs realize inclusive fitness benefits.

THE EFFECT OF EXPERIENCE ON PARENTAL FEEDING INVESTMENT BY MALE AND FEMALE WESTERN GULLS BREEDING ON ALCATRAZ ISLAND

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Parental investment in offspring by long-lived species often depends on the number of years of prior breeding experience. Monogamous species that have biparental care can also show variation in investment patterns between males and females. In this study I document parental feeding investment based on experience and sex and its ultimate effect on seasonal reproductive success in Western Gulls, a monogamous, long-lived seabird. Common prey types provided to young included low skill-low quality (chicken and garbage) or high skill-high quality prey (fish). I detected no effect of parental experience on feeding behavior; however, sex of parent had a strong influence. There was no difference in the percent of feedings given by males and females, although females provided a higher percentage of high-quality food loads. Only when the percent of feedings by females was high did females provide fish at a level that declined to that of the male. Although males provided fewer high quality prey items, they did provide larger low-quality food loads. Females also transferred more of their available food load to chicks, while males had a higher frequency of complete food withholding. Differential nutritional requirements by

male and female parents during the breeding season may underlie these differences in the pattern of parental investment.

FORAGING HABITATS USED BY WOOD STORKS BREEDING IN THE COASTAL ZONE OF GEORGIA, U.S.A.  
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Wood Storks were followed from three different colonies in the coastal zone of Georgia to foraging sites throughout the 1995 breeding season to examine distances and durations of foraging travel, and foraging habitats selected. Most foraging sites were relatively close ( $\bar{x} = 9.8 + 9.5$  km,  $n=42$ ) to their colonies requiring short travel times ( $\bar{x} = 29.5 + 27.0$  min,  $n=42$ ). Distances and flight times for one colony were shorter than for the other two colonies, apparently a result of an adjacent impoundment managed for storks. Freshwater (52.4%) and saltwater (47.6%) foraging sites were utilized almost equally, but saltwater sites were used more extensively in the latter half of the season. Seventy percent of the foraging sites had storks or other wading birds already present when the followed bird arrived. The number of storks and other wading birds already present increased four-fold in the latter half of the season. Storks shifted from using more distant, freshwater foraging habitats with few of foraging waders to closer brackish/saltwater sites with abundant foraging waders as the breeding season progressed, possibly due to either heavy mid-season rains impacting freshwater sites, or seasonal fluctuation in prey numbers in brackish/saltwater marshes.

BEHAVIOUR AND INVENTORY OF MARBLED MURRELETS MEASURED WITH RADAR

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I used high frequency surveillance radar deployed at creek mouths to estimate the numbers of Marbled Murrelets entering and leaving watersheds, and to compare rates of detections with people using the standard audio-visual Pacific Seabird



Group protocol. An accurate watershed census was possible where incoming birds were funneled through narrow inlets (e.g. Bedwell/Ursus system in Clayoquot Sound, B.C.), but counts were less reliable in more open coastline (e.g. Carmanah Valley, B.C.). Detections made at dawn with radar yielded 4-16 times more detections than human observers, and showed a major influx of murrelets well before the peak of audio-visual detections. This audio-visual peak coincided with a period of intensive circling behaviour seen on the radar, suggesting that the PSG protocol is biased towards murrelets which might be prospecting or courting rather than actively nesting. The radar also revealed considerable activity after sunset, a period not normally sampled in the PSG protocol. The flight speeds of birds leaving the forest for the sea were often much higher (mean >100 km h<sup>-1</sup>) than birds circling over the forest, which might indicate an antipredator response to higher densities of potential predators on the coast.

## ECOLOGICAL RISK ASSESSMENTS USING BIRDS: HEAVY METALS IN FEATHERS

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Increasingly, bioindicators of ecological change are required to make informed regulatory decisions, particularly those relating to clean-up of damaged or contaminated sites. In some cases restoration of sites is an important societal goal, as well as management goal. Mercury and Lead are two heavy metals that are frequent pollutants in Superfund, DOE, and other contaminated sites. Feathers are a useful indicator for heavy metal contamination because they metals sequestered there, and levels in feathers correlate with levels in internal tissues. We examine concentrations of lead and mercury in feathers, and compare these levels to those known to cause behavioral or reproductive effects in laboratory experiments. Some individuals of some species that are relatively high on the food chain

have levels that are within the range of those that cause adverse effects. Birds that had dangerous levels were herons and egrets from Asia that feed on relatively large fish, and terns and skimmers from the New York Bight that feed on medium-sized to small fish. In some years, Roseate Terns, an endangered species, also had levels that were within the range that cause behavioral deficits.

## TRENDS IN ORGANOCHLORINE CONTAMINANTS IN SEABIRD EGGS FROM ATLANTIC CANADA, 1968-1992

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Organochlorine contaminants were measured in eggs of three seabird species from 1968 to 1992 to monitor marine environmental quality and assess possible implications for seabird health. Eggs were collected at four-year intervals from eastern Canadian colonies of Double-crested Cormorant (*Phalacrocorax auritus*), Leach's Storm-Petrel (*Oceanodroma leucorhoa*) and Atlantic Puffin (*Fratercula arctica*). DDE and PCB levels have decreased in all species at all colonies since 1972. DDE and PCB levels were higher in the Bay of Fundy and St. Lawrence Estuary than off Newfoundland, and were highest in cormorants and lowest in puffins. Hexachlorobenzene levels, in contrast, have not declined steadily since 1972, and are highest in puffins and lowest in cormorants. Temporal, geographic and interspecific trends will be presented for other organochlorines including dieldrin, oxychlorodane, hexachlorocyclohexane and mirex. Contaminant patterns and trends will be interpreted, considering the historical use of the contaminants and their fate, the seabirds' foraging habits, and the proximity of colonies to different sources. Implications for seabird health and marine environmental quality will be discussed.

## COOPERATIVE RESEARCH ON MARBLED MURRELETS INLAND AND AT-SEA IN CENTRAL CALI-

FORNIA

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A research cooperative was formed to study murrelets both inland and at sea in central California. Due to its small size and geographic isolation, this southernmost population in the Santa Cruz Mountains is vulnerable to extirpation. An intensive effort to locate active nests for video monitoring in Big Basin Redwoods State Park was unsuccessful though 51 different trees were monitored. Protocol surveys at five stations in the park revealed marked differences in detection levels and occupied behaviors. Corvid levels were higher on point count transects associated with high human use. Data sources from the 1970's reveal that Common Ravens have increased substantially in the region especially in the last few years. Repeated near shore at-sea surveys showed that the Ano Nuevo Bay region had consistently high densities compared to other areas. Densities were highest on near shore transects and HY to AHY ratios were low throughout the season. Some indicators of marine productivity were below normal but corvid abundance could also be a factor affecting nest success. Garbage management and visitor education at parks is imperative for murrelet recovery. The cooperative approach is encouraged to foster working relationships between diverse groups and to make informed management decisions.

## REMOVAL OF INTRODUCED FOXES: A RESTORATION METHOD FOR SEABIRDS INJURED BY THE T/V EXXON VALDEZ OIL SPILL

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Black Oystercatcher (*Haematopus bachmani*) and Pigeon Guillemot (*Cepphus columba*) are two species that were injured by the T/V Exxon Valdez oil spill in Alaska in 1989. Removal of introduced foxes (*Alopex lagopus* or *Vulpes vulpes*) from islands is one method of restoring reduced populations. In 1994 and 1995, the T/V Exxon Valdez Trustee Council funded fox removal on Simeonof and Chernabura islands in the Shumagin group near the western edge of the oil's

path. Comparisons of oystercatcher and guillemot populations at Simeonof and Chernabura with nearby fox-free islands showed that foxes kept oystercatchers from successfully nesting and also reduced the nesting density of guillemots. On fox-free islands in the Shumagins, densities of breeding oystercatchers ranged from 0.5 to 2.0 pairs km<sup>-1</sup> of beach habitat, so we predicted that Simeonof should eventually have 20 to 80 pairs of oystercatchers, and Chernabura should have 15 to 60 pairs. Guillemot densities were 2 to 5 times higher on fox-free islands, therefore, future increases within this range are expected following fox removal. Most foxes were removed from Simeonof and Chernabura in 1994, and the remaining animals were eradicated by June 1995. Increases in nesting populations of oystercatchers and guillemots were already evident in 1995.

EFFECTS OF VARIABLE OCEANOGRAPHIC CONDITIONS AND ANTHROPOGENIC IMPACTS ON CORMORANT POPULATIONS IN THE SOUTHERN CALIFORNIA BIGHT  
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Between the 1970's and 1991, breeding populations of Brandt's, Double-crested and Pelagic Cormorants (*Phalacrocorax penicillatus*, *P. auritus*, *P. pelagicus*) increased at the Channel Islands in the Southern California Bight (SCB). In 1992-1993, numbers at several colonies fell during intense El Nino oceanographic conditions. In 1994-1995, numbers partly recovered to 1991 levels. To better interpret population changes, we collated data on population size and anthropogenic impacts, including marine pollutants, fisheries and various forms of human disturbance. Recent increases reflect partial recovery from former decimation in the 1800's and 1900's and in addition Pelagic Cormorants may be experiencing

natural expansion at the southern end of their breeding range. Variable oceanographic conditions and continuing anthropogenic impacts between years and within different parts of the SCB complicates and slows this recovery. Long-term efforts to monitor cormorant populations and reduce human impacts in the SCB are needed.

#### REVERSED HATCHING ASYNCHRONY IN ROCKHOPPER PENGUINS

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Brood reduction in birds is frequently associated with hatching asynchrony, wherein incubation commences before clutch completion, causing last-laid eggs to hatch after earlier eggs. In Rockhopper Penguins, second-laid eggs are typically 25% larger than first-laid eggs and typically hatch sooner, despite a four-day laying interval between eggs. I conducted a field experiment to examine the causes of this unique reversal in hatch asynchrony. Three factors, laying order, intra-clutch egg dimorphism, and laying date contributed significantly and additively to incubation length. By contrast, incubation length was not affected by the timing of incubation onset or absolute egg mass, despite mass-specific differences in egg composition. In addition to its effect on incubation length, laying date was correlated with incubation temperatures. These two associations may be involved in the reversed and extreme egg size dimorphism characteristic of crested penguins.

#### A NEW MODEL FOR STUDYING RECRUITMENT IN COLONIAL WATERBIRDS

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We introduce the use of a new approach, based on Capture-Mark-Recapture designs, in which the analysis of local recruitment is similar to the analysis of survival in reverse. The model considers two essential components, the probability to have previously belonged to

the population of breeders (*seniority probability*) and the probability of recapture, independently of survival. The flexibility achieved allows to compare recruitment among groups within a population, and to test for the effects of environmental variables. We illustrate the method with the study of local recruitment of natives in the Camargue (southern France) population of the Greater Flamingo (*Phoenicopterus ruber roseus*) between 1984 and 1994. Additive effects of age and year were found to affect recruitment. Recruitment noticeably increased in the year following an increase in mortality rate. Long lasting effects of mortality on recruitment were observed in the three following years. There was no evidence of an effect of sex or cohort (year of birth) on recruitment. However, sex, as well as time and age, affected recapture rates. We discuss the various advantages of the model for the study of recruitment in colonial waterbirds.

#### PATTERN OF RECOVERIES OF RINGED RAZORBILLS (*Alca torda*) IN WESTERN ATLANTIC AND ADULT SURVIVAL RATES

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In North America, Razorbill breeds in colonies scattered along the coast of Atlantic Canada and northeastern coast of Maine but with most important concentration in Labrador and the Gulf of St. Lawrence. Given the small North American population (c.a. 15000 pairs) and the large decrease which occurred in the Gulf of St. Lawrence during the seventy decade, an intensive effort to band Razorbill on the North Shore of the Gulf and with less extend in Labrador had been accomplished from 1981 until now (more than 4000 banded birds). Using ringing recoveries of Razorbill from this latest operation and former one on the Atlantic coast we traced their movements and showed how the species could be exposed to different risks during the non-breeding season. More than 50 % of the recoveries came from the Thick-billed Murre hunt in Newfoundland suggesting that shooting could be an important mortality factor



mainly for immature birds. There are too few recoveries to attempt an analysis of survival rates of immatures. A study of a colour-ringed birds combined to triangular band that could be read from a distance started up in 1990 suggests a mean annual adult survival of 90% during the last five years.

## WINTERING BIOLOGY OF WESTERN GREBES IN SAANICH INLET, VANCOUVER ISLAND

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Little is known of the behaviour of Western Grebes (*Aechmophorus occidentalis*), wintering in coastal waters of British Columbia. Unlike other North American grebes, Western Grebes form large flocks often including several thousand birds. Surveys indicate that in mid morning grebes collect into large cohesive flocks which persist until dusk when the flocks begin to disperse. These flocks are primarily "roosting" flocks where most time is spent either resting or preening. Many birds leaving the roosting flock at dusk, travel to other locations, where they begin foraging dives. Grebes followed at this time begin diving more than 1 hour after sunset when light levels at the surface measured as little as 0.0457 mE or  $3.0 \times 10^{-3}\%$  of daylight (full sun). Similar crepuscular foraging behaviour has been documented for the Great Crested Grebe in the Netherlands, where Piersma et al. (1988) have associated this dispersal with increased availability of vertically migrating prey. Saanich Inlet is a unique fjord-like body of water that contains a dense population of vertically migrating euphausiids as well as non-migratory amphipods. Our research will examine the nature of the prey stock that supports wintering grebes and how crepuscular foraging offers a unique solution to energetic constraints on the wintering grounds.

## ASSOCIATION OF NESTING BLACK SKIMMERS AND TERNS; TOO MUCH OF A GOOD THING?

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The benefits of coloniality has been widely discussed, as has the benefits of some interspecific associations. Black Skimmers (*Rynchops niger*) are regularly found nesting with or among various species of terns (*Sterna*) and are thought to gain an advantage in the form of predator defense from the aggressive, predator-mobbing terns. Black Skimmers in California frequently nest in association with larger Caspian (*Sterna caspia*) and Elegant (*Sterna elegans*) Terns. Although there may be the previously implied benefits there are also some substantial disruption and reproductive failure due to the activities and movements of the dense creche of Elegant Tern chicks. This suggests that the costs as well as benefits must be determined for mixed species associations.

## PRODUCTIVITY OF HARLEQUIN DUCKS BREEDING IN PRINCE WILLIAM SOUND, ALASKA

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I used breeding status of females, clutch size, and size and age of broods as indices of productivity of harlequin ducks in eastern Prince William Sound. Eighty percent and 73% of adult females captured at stream mouths were breeding birds in 1991 and 1992, respectively. Non-breeding females were classified as adults (paired) and subadults (unpaired). Paired, non-breeding females weighed significantly more than unpaired, non-breeding females ( $P = 0.018$ ), adding support to age classifications. Average clutch size was 6.1 ( $n = 8$ ). Linear density of nests was approximately 0.2 - 1.1 /km for 7 known breeding streams. Using average clutch size, and age and number of ducklings in broods observed during surveys ( $n = 42$ ), I estimated that duckling mortality was approximately 59%. However, I could not account for loss of entire broods. Most mortality occurred during 15 - 35 days of age. Average brood size at fledging was 2.67. Using estimates of duckling mortality to fledging age and numbers of breeding and adult females in the population, estimated recruitment rate was 0.6 - 1.1 young per breeding female and 0.4 - 0.8 per adult female. Coastline

densities of broods during 1991, 1992, 1993, and 1995 were 2.3, 0.9, 1.8, and 1.3 /100 km, respectively. Harlequin ducks exhibit breeding characteristics consistent with other sea duck species. Extrinsic factors, such as late spring snow precluding nest initiation, probably influence productivity of harlequins in EPWS.

## FEEDING HABITAT OF HERONS ON THE UPPER MISSISSIPPI RIVER

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We followed great blue herons ( $n = 185$ ) by airplane to their feeding sites from 4 breeding colonies on the upper Mississippi River between 13 April and 23 July 1995. There was little overlap in feeding locations between nearby colonies. More herons left the Mississippi River to feed during the care-of-young period (37.2%) than during incubation (17.3%) ( $\chi^2$ ,  $P = 0.0107$ ). Of those herons staying on the Mississippi River to feed, 84.7% fed in braided channel habitat below a dam or levee, 9% fed along the main navigation channel, 3.6% fed in open pool habitat above a dam or levee, and 2.7% fed in flooded agricultural fields. Of those herons feeding off the Mississippi River, 65% went to smaller creeks and rivers, 30% went to farm ponds and barrow pits, and 5% went to a power plant. Flight time to reach an off-river feeding site was 16 min 59 sec compared to only 4 min 45 sec to reach an on-river feeding site. Herons generally landed on dead or live vegetation mats (40% of time), bare ground (26.5%), logs/snags (23.1%), other substrates (rocks, treetops, etc., 6%) and then walked into the water from there to feed. Herons landed directly in water only 4.3% of the time.

## NESTING OF GREAT BLUE HERONS ON THE UPPER MISSISSIPPI RIVER IN RELATION TO THE 1993 FLOOD

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Great Blue Heron eggs were collected from 10 colonies on the Upper Mississippi River (UMR) in 1993. The collection year coincided with a flood in the midwest United States which surpassed all previous United States floods in terms of precipitation amounts, record river levels, flood duration and area of flooding. Great Blue Herons nesting in the five southern colonies on the UMR, an area of major flooding, began nesting later, had fewer eggs per clutch, and smaller eggs than those nesting in the five northern colonies, which were less affected by the flood. We suspect that flooding of the feeding habitat influenced these reproductive parameters. Data from 1995, a year without major flooding on the UMR, support this hypothesis. In 1995, the timing of nesting, number of eggs per clutch, and egg volume were similar between northern and southern colonies.

#### PARENTAL INVESTMENT BY RHINOCEROS AUKLETS AT THE COLONY AND AT SEA OFF VANCOUVER ISLAND

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Colony-based measures of provisioning, chick growth and parental time budgets were combined with oceanographic measures of bird and prey densities for Rhinoceros Auklets at Seabird Rocks, off Vancouver Island. The goal was to describe the response of parental provisioning efforts to varying levels of prey abundance and availability, for the first time in oceanic ornithology. The Rhinoceros Auklet was selected because its diet, breeding biology, diving behaviour and physiology are well known and it was suggested to be the ideal species for monitoring ocean conditions off British Columbia. Parental time budgets, measured by visual scans, showed that auklets spent very little of their time at sea foraging (5 %). This suggests that prey was readily available, thus time-buffering was not observed. Chick growth rates ( $4.7 \pm 3.1$  g/d) and meal sizes ( $28.6 \pm 17.6$  g) were within normal ranges for Rhinoceros Auklets reported elsewhere. Weak correlations were found between bird and prey densities (measured with a 200 kHz echo

sounder) in transects around the colony. This suggests that prey densities had reached a threshold level, providing the auklets with a number of high quality prey patches to choose from. Consequently, highly efficient parental provisioning efforts were observed, resulting in high breeding success.

#### ASHY STORM-PETREL VOCAL BEHAVIOUR PROVIDES CLUES TO THEIR BIOLOGY

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The Ashy Storm-Petrels (*Oceanodroma homochroa*) have cryptic breeding colonies preventing the straight-forward study of their biology. Fortunately, their vocalisations are highly conspicuous during the breeding season and the birds can be readily drawn to playback. By examining only their vocalisations and vocal behaviour we can begin to understand more of this species biology in the context of what has been discovered for other storm-petrels. Among seabirds, storm-petrels possess some of the most complex, oscine-like vocalisations or songs. For the Ashy Storm-Petrel, I have been able to establish that: both sexes as well as breeding and non-breeding birds vocalise, and birds respond most strongly to playback of conspecific calls although they still approach the calls of various sympatric species of storm-petrel. The structural features of their calls suggest particular phylogenetic affinities with other storm-petrels.

#### DO THE ALCIDS TAKE ADVANTAGE OF ACOUSTICAL WINDOWS?

Sharon B.C. Dechesne, Dept. of Biology, Univ. of Victoria, Victoria, B.C., V8W 2Y2.

Alcidae vocal repertoires examined to date vary in size from 4-10 call types, and calls show great diversity in both their structure and function. The theory surrounding "acoustical windows" predicts that the structure of calls should optimise accurate and/or long-distance transmission of signals in the habitat that the species occupies. This window is framed by frequencies and call features that do not transmit well due to competing sounds or

structural features of the habitat that cause sound degradation or absorption (e.g. vegetation). During the non-breeding season, all members of the family Alcidae occupy an acoustically similar marine environment, and thus the overall acoustic window that is available to them is similar. Body size, however reduces the portion of the acoustic window that is available to each species, by limiting the birds to higher or lower pitched calls. During the nesting season, alcids occupy a number of diverse habitats (e.g. rocky cliffs, grassy slopes, forest), each with different acoustical regimes or "windows". Alcids' varied social behaviours and contexts of communication may make the presence of other call features preferable, and explain the existence of many calls that are subject to high levels of degradation; further evidence for this can be found by comparing the vocalisations of species of sympatric species of similar size.

#### COMPARISON OF NESTING FORSTER'S TERNS (*STERNA FORSTERI*) AND COMMON TERNS (*STERNA HIRUNDO*) IN THE SAME SALT MARSH IN NORTH CAROLINA

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On the North Carolina coast Forster's and Common Terns nest on small estuarine islands. This study compares several nesting parameters of Forster's and Common Terns on several islands in Back Sound, NC during the summer of 1995. Forster's and Common Terns showed significant differences in time of nest initiation, nest placement, nest construction, clutch size, egg size, and nest success. Forster's terns began nesting three weeks before Common Terns, and while Forster's Terns nested almost exclusively on wrack, Common Terns used a mix of wrack, sand/shell, and short vegetation. Forster's Tern nests were larger overall, and were placed higher above ground. Average clutch size of Forster's Terns was 2.81 while that of Common Terns was 1.92, also Forster's Tern eggs were larger. Forster's terns showed a higher nesting success than Common Terns which was due to their earlier nesting and higher placement of nests.

## RESTORATION PROPOSALS FOR COMMON MURRES IN CENTRAL CALIFORNIA

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The government's proposals to restore Common Murres assumed lost to the *Apex Houston* oil spill in March 1986 include the establishment of a captive breeding program, a rehabilitation program, and the use of decoys and audio playbacks at inactive and active colonies. Lack of funds limits current efforts to the social attraction program. The proposed captive breeding program calls for the establishment of a breeding population of 200 permanently injured murres to produce 1002 young over twenty years. The rehabilitation program anticipates returning 3000 birds to the wild over the same period. The expected 4000 released birds would be less than 1 percent of the estimated production of young in the wild over the same period (695,000 chicks). Additionally, the captive breeding proposal disregards the importance of post-fledging parental care in *Uria*. The rehabilitation proposal ignores the high post-release mortality of rehabilitated birds and the lack of evidence that alcids can enter or return to breeding populations following rehabilitation. Social attraction to attract birds to specific rocks could disrupt natural patterns of recruitment and decrease reproductive success. All of the proposals ignore the ability of murre populations to naturally form new colonies or increase the size of current ones when favorable conditions exist.

## THE TIMING OF THE DECLINE OF COMMON MURRES IN CENTRAL CALIFORNIA

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Swartzman and Carter (1992) believed mortality from a March 1986 oil spill was responsible for the extirpation of the Devil's Slide Rock Common Murre colony and significant reductions at Castle Rocks and Hurricane Point Rocks. Examination of data from before and after the spill raises questions about their conclusions. Abandonment of the Devil's Slide colony had earlier been associated with intense fishing in adjacent waters

(Takekawa, Harvey and Carter 1990). A single gill-net mortality adjacent to the colony in 1983 involved a minimum of 943 birds. The 1982 population was estimated at 2570 birds, but less than 50 were present in 1984 (L. Spear pers. comm.). Over 100 were present in 1987 (D. Wester pers. comm.) but the colony was abandoned later in the decade. Evidence that an early 1986 mortality had a major impact on the Castle Rocks and Hurricane Point Rocks colonies is also lacking. These two colonies, totaling 5800 birds in 1980, collectively decreased 39 percent from 1980 to 1982. However, from 1982 to 1986, when other central California colonies declined from 46 to 96 percent, they declined only 12 percent. A decline of 47 percent from 1986 to 1989 may be related to gill-net mortality (Carter and Gilmer 1990).

## VARIATION IN RATES AND AGE OF RECRUITMENT IN A BLACK GUILLEMOT COLONY

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Recruitment opportunities at a small (< 15 pairs) Black Guillemot colony were increased through the creation of more than 200 nest sites from 1975 to 1981. Banding of all young since 1975 has shown cohorts typically return to their natal colony at three years of age. During colony growth, when nest-site availability was not limiting, age at first breeding averaged 3.6 years with 86 percent of returning cohorts recruited. After colony expansion when nest sites were limiting, age at first breeding was 5.2 years with 35 percent of returnees recruited. Recruitment of cohorts is limited by competition for nest sites with immigrants. Immigrants comprised more than 75 percent of recruits during population growth and only since 1990, when the population began declining, have native birds constituted more than 50 percent of annual recruitment. A recent decrease in survival of breeding birds has not resulted in increased recruitment, due in part to an apparent concurrent decline in survival of nonbreeders. However, the resulting vacancies in nest sites have allowed the recruitment rate of returning cohorts to increase to levels similar to those during

colony expansion. Currently, in some subcolonies at least, recruitment may be limited by mate availability.

## HABITAT USE AND COLONY SITE DYNAMICS IN SOUTH CAROLINA WADING BIRDS

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Statewide aerial and ground censuses of wading bird colonies, conducted during 1988-1994, were assessed to determine the effects of coastal development and prioritize colonies for protection. We examined the relationship between total wetland, tidal wetland, and impoundment area and wading bird nesting in South Carolina. We calculated annual and 5-year turnover rates for wading bird colonies and tested for differences in turnover rates between large (> 100 nests) and small (< 100 nests) colonies and between colonies with a history of activity. Total and tidal wetland hectares were grossly correlated with wading bird nesting. Wading birds were found to be nesting at an average density of 0.065 nests/hectare of wetland habitat. The average annual turnover rate was low ( $T=0.1751$ ), and the average probability of activity was high (83.5%). Turnover rates were higher for colonies with < 100 nests, and colonies without 3 years of previous activity. In prioritizing colonies for protection, emphasis must be on large colonies, particularly those with a history of activity. Management activities should concentrate on defining areas with numerous small colonies and high turnover rates, and creating protected colonies in high quality nesting habitats.

## EFFECTS OF WINTER MANAGEMENT REGIMES ON WATER BIRD USE OF RICE FIELDS

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As a result of recent legislation to reduce stubble burning, many rice-farmers in California have begun flooding their fields during winter to enhance rice-straw decomposition. This practice is also ex-



pected to benefit a variety of aquatic bird species. During the winters of 1993/94 and 1994/95, I conducted censuses of 47 intentionally-flooded and 26 control rice-fields in the Sacramento Valley. All waterfowl, waders, and shorebirds were identified and counted. I tested the hypotheses that (1) intentionally-flooded fields would contain higher densities of the study species than control fields, (2) different methods of managing residual straw would influence bird use in the flooded fields, and (3) species would differ in their use of different water depths. All three species groups occurred at higher densities in fields that farmers had flooded, although some individual species (geese, cranes, herons) did not. Straw incorporation methods had no clear impact on bird use. Species densities varied with water depth, however, the nature of these effects were modified by local conditions. These results provide guidelines that can improve the management of rice-fields for waterbirds in a manner compatible with continued agricultural use.

#### THE EFFECT OF SEA LEVEL RISE ON A MIGRATORY WADER

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The intertidal mudflats of the Wadden Sea are of vital importance to ensure the survival of the 7,000,000 waders that migrate along the East-Atlantic Flyway. To investigate the possible harm of sea level rise due to global climate change we chose the Oystercatcher (*Haematopus ostralegus*) as a model species. The total population size is thought to result from an equilibrium between density-dependent mortality during winter and density-dependent reproduction during summer. The mortality curve is constructed from knowledge on interference, where especially sub-dominant young individuals suffer a decline in food intake when bird density rises. The chick production curve is constructed from knowledge on competition for territories of high quality and the resulting increase in the occupation of poor territories and number of nonbreeders queuing for high quality territories with rising numbers of potential breeders. It can be calculated how

changes in winter habitat surface will affect the winter mortality curve, and therefore, the total population size. It turns out that even under extreme scenarios of sea level rise, the negative effects on the population will be small. However, the current model ignores effects of temperature, which are known to affect the population dynamics of the prey.

#### HAS THE INVASION OF LAKE ERIE BY DREISSENID MUSSELS AFFECTED BREEDING FISH-EATING BIRDS?

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Colonial waterbirds have been used successfully as bioindicators in many aquatic ecosystems. In the late 1980s Dreissenid mussels were inadvertently introduced to Lake Erie, and now occur throughout the lake, at densities up to 3/4 million m<sup>-2</sup>. To evaluate effects on breeding colonial waterbirds, we compared 1990s data with those from the 1970s and 1980s. Numbers of breeding Herring Gulls and Great Blue Herons have remained fairly stable, whereas Common Terns and Black-crowned Night-Herons declined steeply. Breeding Double-crested Cormorants and Ring-billed Gulls have increased greatly since the mid-1970s. Productivity of Herring Gulls remained high (1-2 young /nest/year) throughout, as diet shifted to more Freshwater Drum (a fish which feeds heavily on Dreissenid mussels). Levels of organochlorine contaminants in Herring Gull eggs declined steeply until the early 1980s, but have fallen relatively little over the past decade. Competition for nesting space with Ring-billed Gulls has caused some Common Tern declines, but probable high sensitivity to contaminants is another suspected factor. At present we have no evidence of marked population-level effects in these species which can be attributed to invasion of this lake by Dreissenid mussels.

#### MONITORING THE EFFECTS OF A MAJOR OIL SPILL ON AN INSHORE SEABIRD: BLACK GUILLEMOTS (*Cephus grylle*) IN SHETLAND

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Black Guillemots are common inshore, largely resident diving seabirds in Shetland, and are highly vulnerable to oil pollution incidents. Since 1983 we have designed and operated an integrated monitoring scheme for this population to track recovery from the *Esso Bernicia* spill in Yell Sound in 1979, and to quantify effects of other oil incidents. The scheme has three components: pre-breeding census of adults attending colonies in fixed monitoring sites; monthly and ad hoc beached bird surveys; standardized boat-based transects in inshore waters in winter. We report results from each element, to evaluate the scheme's sensitivity. Pre-breeding numbers in Yell Sound increased at 9% p.a. from 1983 to 1993, and by 18% p.a. from 1991-1993. Steady population recovery for 7-10 years was evident from the winter boat transects. Changes in numbers at monitoring sites elsewhere were often associated with smaller confirmed oil slicks. For example, declines of 18-37% were noted at four sites close to the winter 1992-93 Braer oil incident in S. Shetland, followed by increases of 6-37% in 1994.

#### HERON POPULATION TRENDS IN EUROPE

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Nesting populations of European herons seem to be mainly regulated by winter survival, affected by climatic conditions on the wintering grounds (Europe for residents, West Africa for migrants). We analysed 1968-1994 time series of population data for Italy (northwest, with 40 heronries), Camargue (France, 20 heronries), Albufera Valencia (Spain, 5), Netherlands (10), Dneestr Delta (Ukraine, 5), and we sought relations with a measure of



the hydrological conditions in West Africa (maximum water levels at Lake Debo, Mali). Grey Herons and Cattle Egrets increased everywhere, whereas Black-Crowned Night-Herons, Little Egrets, Squacco and Purple Herons fluctuated widely without significant trends, but in each region their populations decreased from the late '70 to mid-'80. When all our study regions were tested together (normalized data), the correlations nesting herons / hydrology in Africa were significant for Purple Herons ( $P=0.001$ ) and for night-herons ( $P=0.02$ ); for Squacco Herons the correlation was positive but not significant; all these 3 are migrants. When each region was tested separately, significant correlations with hydrology in Africa emerged in 5 cases out of 15. As expected, Grey Herons and Little Egrets, that winter mainly within the Mediterranean, showed no relation with hydrology in Africa.

#### DO RADIO TELEMETRY POINT OR AREA ESTIMATES MORE ACCURATELY DESCRIBE A COLONIAL WATERBIRD'S HABITAT?

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Radio telemetry data have traditionally been treated as error-free when incorporating habitat variables with animal positions. However, radio tracking provides only an estimate of the animal's position. We describe a new method to couple habitat variables in a Geographic Information System (GIS) with radio telemetry area estimates. We used principal components analysis to determine the probability weights for GIS pixels surrounding point estimates of radio telemetry positions. When habitat variables from a GIS were coupled with LORAN-C radio telemetry positions, estimates of most habitat variables were the same whether we used radio telemetry point or area estimates. Although we used terrestrial habitat types in our computer simulations, our results can be applied to colonial waterbird habitat studies.

#### NOMADIC BREEDING, INTERANNUAL DISPERSION, AND RANGE EXPANSION OF WHITE IBISES AS GUIDELINES FOR RESERVE NETWORK DESIGN

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Unlike many wading birds, White Ibises (*Eudocimus albus*) are extremely nomadic and opportunistic nesters, and present unique challenges to conservationists. In the southeastern U.S. during the last 60 years, the breeding population has colonized at least 6 new states, and the weighted center of breeding has shifted from south Florida, to central Florida, to coastal South Carolina, and finally to Louisiana; the maximum breeding population may have been reduced by half since the 1970s. Most breeding locations are novel, are used for periods of less than fifteen years, and are rarely used heavily after being abandoned. Colonization appears to depend upon the availability of superabundant food, often sparked by natural disturbance events. Abandonment is typically associated with both natural and human-induced degradation of foraging habitat. The scale and unpredictability of movements dictate that a wetland reserve system must be geographically diffuse and of large total size; habitat requirements dictate that reserves must incorporate both coastal and inland habitats. Individual wetland reserves must be large enough to support natural disturbance events that result in high prey availability. The ecological mechanisms producing such pulses of prey are poorly understood, and are critical to the design of a wetland reserve system for this species.

#### COMPARISON OF AERIAL AND GROUND TECHNIQUES FOR DISCOVERY AND CENSUS OF LONG-LEGGED WADING BIRD NESTING COLONIES IN THE FLORIDA EVERGLADES

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and G. Thomas Bancroft, National Audubon Society, 115 Indian Mound Trail, Tavernier, FL 33070.

During 1992 - 1995, we performed systematic aerial and ground searches for wading bird colonies in the central Everglades. For each year, we compared counts derived solely from systematic aerial surveys, with estimates that included information from both aerial and ground searches. The aerial method alone underestimated total numbers of colonies ( $>10$  nests) by a annual average of 61% (range 31 - 80%), resulting in an underestimate of total nest starts of 29% (range among years = 15 - 45%). Light-colored species (Great Egrets, White Ibises, Snowy Egrets, Cattle Egrets) were relatively well quantified by aerial surveys alone ( $x = 85.2\%$  of nests,  $78.6\%$  of colonies), while colonies of dark-colored species were much more rarely discovered ( $x = 17\%$  of nests,  $15\%$  of colonies). These errors stem largely from the inability of even experienced aerial observers to discover colonies; inaccuracies in counting nests were not assessed directly by this study. The Everglades habitat we surveyed is extremely open and presents a best-case scenario for discovering colonies from the air. We strongly recommend that systematic ground searches always be coupled with aerial surveys over large areas.

#### PHYLOGENY AND EVOLUTION OF THE SULIDAE

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Although the neo-Darwinian model of speciation is widely accepted, it does not provide satisfactory explanations for many evolutionary phenomena, such as adaptive radiations. Alternative models have been suggested, but are largely untested in vertebrates. Molecular data provide two new sources of information for understanding speciation: 1) they enable dates of speciation events to be estimated; and 2) they enable ecological characteristics of ancestral species to be inferred. Thus, specific hypotheses can be developed from paleoecological data and tested

with molecular data. We sequenced 450 base pairs of the mitochondrial cytochrome b gene from eight of nine extant species of sulids. Phylogenetic analysis indicated that gannets (genus *Morus*) and boobies (genus *Sula*) are distinct. Cape (*M. capensis*) and Australasian (*M. serrator*) gannets, and blue-footed (*S. neobouxii*) and Peruvian (*S. variegata*) boobies were sister-species. Blue-footed, Peruvian, Masked (*S. dactylatra*) and brown (*S. leucogaster*) Boobies were monophyletic, but relationships between the Masked and Brown Boobies were unclear. The Red-footed Booby (*S. sula*) was the most divergent booby. Tests of specific hypothesis designed to discriminate between alternative models of speciation suggest that the neo-Darwinian model is generally satisfactory for sulids.

#### POLLUTANT EXPOSURE OF CORMORANTS ON THE PACIFIC COAST.

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The pollutant exposure and risk to cormorants along the Pacific Coast varies significantly by geographic region. Areas of highest exposure to persistent organochlorines include those areas adjacent to historic industrial outfalls of DDT and PCBs, and from bleached kraft pulp mill effluents. The major areas of pollutant exposure are Southern California, San Francisco Bay, the Columbia River, Puget Sound and the Straits of Georgia in British Columbia. DDT and PCB risks are reduced compared to the 1970s, but still remain significant. Recent changes in effluent discharge requirements and bleaching processes have reduced pulp mill effluent chlorinated organics, but these still remain significant risks to malformations and reduced productivity of cormorants. Beak and facial malformations in cormorants in SF Bay resembled those of birds from the Great Lakes and British Columbia. Heavy metals, especially Se and Hg in SF Bay remain risks to all aquatic waterbirds. Eggshell thinning is still significant in southern California as DDT residues persist in the southern California Bight. This work was supported by USFWS Contract

14-48-0001-93545, and by the US EPA (R819658) Center for Ecological Health Research at U. C. Davis.

#### A VIDEO CANDLING DEVICE FOR EVALUATING EGG VIABILITY OF BIRDS IN THE FIELD

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A video tape recorder and a high intensity halogen light source were fitted into a light tight carrying case with a neoprene cuff hand access hole for candling eggs in the field. Clutches of cormorant eggs were evaluated for stage of incubation and frequency of early and late dead embryos. Eggs were collected for pollutant analysis and liver enzyme assays. Evaluation of 100 eggs per colony enabled an assessment of egg viability, with one colony in San Francisco Bay having 23% dead eggs in nests at peak incubation. Collection of late dead embryos provided data on beak and facial malformations. Candling eggs in the field provides an assessment of productivity which is difficult to determine without multiple visits to a colony, which may, itself, lead to disturbance, increased egg abandonment, predation, or other losses. Videotaping can also provide a permanent record of activities in a breeding colony, providing data which can be analyzed at a later date. This work was supported by the US EPA (R819658) Center for Ecological Health Research at U.C. Davis.

#### BLACK NODDY NESTING BEHAVIOR

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In a two-year study of color-banded Black Noddies (*Anous minutus*) nesting on Tern Island in the Northwestern Hawaiian Islands (NWHI), I documented that each year about 40% of pairs successfully nested twice during the annual nesting season. In contrast, no Black Noddy pairs attempted a successive clutch on either Laysan Island (in the NWHI) or on Heron Island (in Australia) during the annual nesting season I studied each of these populations. This reproductive strategy is rare in the Laridae: only one other

species has been reported to commonly fledge successive broods. I examined reproductive success and the incidence of attempted successive clutches on three levels: among Laridae species, among Black Noddy populations, and among individuals of the Tern Island population. I also examined mate and nest fidelity on the species, population, and individual levels. Higher Black Noddy mate and nest fidelity appear to be associated with higher reproductive success during both the previous and the following seasons. Pairs which nested successfully were less likely to divorce than unsuccessful pairs; after divorce the average reproductive success of individuals declined. Pairs which fledged successive broods were also less likely to move to a new nest the next season; after moving to a new nest, pairs fledged significantly fewer successive broods.

#### OVERWINTERING OF BLACK SKIMMERS IN CALIFORNIA; SITE FIDELITY AND INTER-SITE MOVEMENTS

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The first recorded nesting of Black Skimmers (*Rynchops niger*) in California was in 1972 at the Salton Sea. By 1975, skimmers had colonized the coast in San Diego and, by 1985, were nesting at Bolsa Chica Ecological Reserve (Orange, Co.). Beginning in 1992, individualized color bands were utilized to facilitate more detailed observations. Observations points were set up in California (Santa Barbara, Point Mugu, Seal Beach, and San Diego) and Baja California, Mexico (San Quintin) and weekly observations made from the months of September to May, 1992-93, 1993-94, and 1994-95. Skimmers arrived at their wintering sites during the months of September and October, reached high mid-winter population levels, and then departed during the months of April and May. A high site fidelity (>50%) to overwintering areas has been documented, although there is also some regular movement between sites within the winter season. Observations as these have not been possible in highly migratory populations of Black Skimmers.



# GLOBAL CONSERVATION STATUS OF GULLS AND TERNS

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Several of the 51 species of gulls and 44 species of terns are globally threatened or endangered. Many species are highly localized and their wetland habitats suffer encroachment. Several species are globally rare with under 5000 pairs in few colonies. Lava Gull, the rarest with only 400 pairs, is not endangered as long as the Galapagos can be protected. The virtually unknown Saunder's Gull has only 7 known breeding sites and <2500 pairs, and all sites are threatened by wetlands development (e.g., prawn & fish culture). Kerguelen Tern is threatened, with 80% of its 2500 pairs on Kerguelen where there is a large cat population. Relict Gull has also declined severely in its known breeding areas. Rare but apparently stable are Yellow-footed and Olrog's Gulls and Damara Tern. Other more numerous species are declining in the face of direct exploitation (White-eyed Gull, Roseate Tern), predation (Peruvian Tern), habitat loss (River Tern) or are vulnerable to future habitat disruption (Black-billed Gull and Black-fronted Tern to dams on their braided rivers). Even the abundant Heermann's Gull and Red-legged Kittiwakes have fewer than 10 known colonies, with most of the population in a single colony (Isla Rasa, St. George). Among the good-news stories, Audouin's Gull has increased to over 10,000 pairs in 30 breeding colonies. There are also several convincing winter sight records of Chinese Crested Tern, a species long-feared extinct, whose breeding grounds have never been found.

# FACTORS GOVERNING CLUTCH-SIZE IN PURPLE HERONS BREEDING IN THE EBRO DELTA, SPAIN

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Clutch-size, population density, colony distribution, and survival of nests, eggs,

and chicks during their nidicolous stage were monitored for Purple Herons (*Ardea purpurea*) in the Ebro Delta (NE Spain). Clutch-size values ranged from 2 to 6 eggs/nest, but only clutches of 3,4, and 5 are frequent. The survival of chicks was 100% for clutches of three, and then declines by an average of 10% as clutch size increases by one egg. Productivity models built up on these data well explain the range of clutch size values found. Mean clutch-size declined as the number of breeding pairs increased, indicating a density-dependent regulation of this population. This density-dependence is also shown through the progressive scattering of the colony sites. Neither, nest survival nor egg survival was not significantly different among years, whereas chick survival showed significant differences between years, indicating that one of the years was clearly worse than the others during the chick rearing stage. The functional value of clutch size variation is discussed considering all these data.

# BIAS ASSOCIATED WITH DIET SAMPLES IN GULLS: REGURGITATES VS PELLETS AND FOOD REMAINS

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To assess the information quality on diet composition supplied by four different kinds of samples of ingested food: 1) regurgitates, 2) partially undigested pellets, 3) pellets, and 4) food remains, we collected samples corresponding to these four categories, only for adult Audouin's gulls, at two colony sites (the Chafarinas Is and the Ebro Delta) during May and June of 1993 and 1994. The comparison was performed using taxonomic categories only. Parameters such as frequency of occurrence, species richness, spectral trophic diversity, identification level allowed, and biomass ponderation are used to compare the reliability and the usefulness of the information provided by each kind of sample. Our results show that regurgitates and partially digested pellets

were largely unbiased relative to other samples, thus suggesting that they are the most suitable samples on which to assess diet composition while analyzing gull's ingested prey items.

# INFLUENCE OF FOOD AVAILABILITY ON INTERACTIONS BETWEEN TWO MEDITERRANEAN GULLS BREEDING SYMPATRICALLY

Jacob González-Solis\*, Xavier Ruiz, Dept. de Biología Animal, Univ. de Barcelona, Av. Diagonal 645, Barcelona-08028, Spain, and Lluís Jover, Dept. de Salut Pública (Bioestadística), Univ. de Barcelona, Av. Diagonal s/n, Barcelona-08028, Spain.

Aerial and terrestrial intrusions, predation on eggs and chicks, and kleptoparasitism, both aerial and on courtship feedings, of the Yellow-legged Gull (*Larus cachinnans*) on the Audouin's Gull (*Larus audouinii*) were studied at a colony in the Chafarinas Is. (off the Mediterranean coast of Morocco) during two consecutive breeding seasons. About 450 h of observations were carried out from a hide on groups of 20-100 breeding pairs of different Audouin's Gull sub-colonies, encompassing the whole breeding cycle of this latter species. Since *Larus cachinnans* feeds mainly in association with commercial fisheries, to test whether the food availability and the energetic demands influence the frequencies of the different variables analyzed, we compared the occurrence of interactions between periods with high (normal fishing activities) and low (reduced activity of fisheries) fish availability. Our results show a significant increase in interactions during periods with lower food availability and higher energetic demands by the Yellow-legged Gull.

# HABITAT SELECTION AT THREE SPATIAL SCALES IN A GULL HYBRID ZONE

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We investigated the ecology of breeding pairs in the Glaucous-winged Gull/Western Gull hybrid zone on the



coast of Washington. At the local scale, hatching and fledging success were highest in the area of highest nest density, where natural screens were large and blocked the nearest neighbor. At the neighborhood scale, pairs nesting in dense stands of reeds laid earlier and larger clutches, hatched more chicks, and fledged more chicks than pairs nesting in sand or dunegrass. At the colony scale, pairs nesting on Sand Island laid larger and earlier clutches, hatched and fledged more chicks than pairs breeding on Goose, No Name and Whitcomb Islands. Extensive egg predation by gulls as well as egg, chick and adult predation by Bald Eagles was observed at all colonies, and nest attendance was low at all colonies. Egg predation was mitigated almost exclusively by nesting in dense reed habitat, which occurs in the interior of the centermost colony. Reproductive success at these colonies is extremely low. Choice of nesting habitat at all scales is critical, and differences among pair types may determine the future of these colonies and this hybrid zone.

#### NEAR SHORE FEEDING BEHAVIOR OF LOONS IN ONSLOW BAY, NORTH CAROLINA

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Large numbers of Common and Red-throated Loons winter in Onslow Bay, North Carolina. Some of these birds forage on the bottom in the surf zone in water 0.5-2 m deep on relatively calm days. Prey items captured by Common Loons included 7 mole crabs, 6 crabs (shaped like small blue crabs), and 6 fish (including 2 small flounders). Common Loons were successful (prey seen upon surfacing) 4.6 % of their dives ( $n = 303$  dives) and Red-throated Loons were successful on 3.1 % of their dives ( $n = 64$  dives). Duration of unsuccessful dives ( $30.9 + 12.3$  sec,  $n = 289$ ) was not different from successful dives ( $28.2 + 12.3$  sec,  $n = 14$ ) by Common Loons. Duration of unsuccessful dives ( $27.0 + 9.3$  sec,  $n = 62$ ) was not different from successful dives ( $28.8 + 2.5$  sec,  $n = 2$ ) by Red-throated Loons. Visibility and possible abrasive effects of suspended sand on the

eyes of loons will be discussed.

#### AN OVERVIEW OF SEABIRDS AND COMMERCIAL FISHERIES INTERACTIONS IN WASHINGTON

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While anecdotal accounts of seabird mortality in gillnets in Washington have existed for many years, two events elevated the issue to the forefront in 1992. In September, 1992, the Marbled Murrelet was federally listed as a threatened species. In addition, the Fish and Wildlife Service (FWS) obtained data in 1992 from a National Marine Fisheries Service observer program on the outer Washington coast which documented seabird mortality in these fisheries. An observer program in the 1993 fishing season provided coverage of the Puget Sound salmon fishery, although at a very low sampling rate. It provided valuable information for structuring further observer programs and documented seabird mortality. In 1994, an observer program was conducted in the sockeye salmon fishery, which provided an accurate estimate of seabird mortality. Based on the results of the observer program, several conservation measures were implemented in 1995, including closures of areas with high marbled murrelet densities, a change to daylight fishing hours in the sockeye fishery, and establishment of a radio network with advisories on seabird concentrations. Modified gillnets with visible upper panels are also being tested. The FWS is continuing to work on this issue with the state, tribes, fishing industry and environmental groups.

#### AGE-RELATED SIZE DIFFERENCES IN BREEDING ROSEATE TERNS (*Sterna dougallii*)

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Roseate terns on Bird Island, Massachusetts show moderate variability in mensurable characters (e.g., length of

exposed culmen,  $CV = 3.6\%$ , range 34.0 to 42.7 mm). Some of this variation is attributable to sex: males are generally larger than females. This paper addresses variation of adult birds related to age and is based on recaptures and resightings (1987 to 1995) of individuals sexed with a molecular marker. Culmen length of older Roseates is greater than younger breeding birds (ages 2 to 16 years). Such a pattern could result from differential mortality of smaller birds or from continued increase in culmen length. Resightings of measured individuals provide no evidence for differential mortality by size. Measurements repeated in different years indicate increases in culmen length but considerable variability. Similar analyses of tail length (possibly an ornament) will be presented.

#### USING IMPLANTED SATELLITE TRANSMITTERS TO TRACK THE MOVEMENTS OF MURRES AND PUFFINS

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To track the movements of breeding Common and Thick-billed Murres and Tufted Puffins, we surgically implanted 35-gram satellite transmitters at three field locations in Alaska (Barren Islands, Cape Lisburne, and Cape Thompson). Implantation disrupted most breeding attempts of murres at the Barren Islands. Birds stayed out at sea, primarily foraging south to Kodiak Island at distances of 40-100 km from the release site. Murres from capes Lisburne and Thompson foraged north and west into the Chukchi Sea. Individuals that retained breeding status in those colonies showed typical foraging ranges of 70-80 km. Locations of birds that ceased to commute averaged about 170 km from the colonies in the first month after release. First-month mortality was high for instrumented puffins (80%) and murres (60%) at the Barren Islands, moderate for murres at Cape Lisburne (50%), and low for murres at Cape Thompson (0%). The differences in mortality among study areas may reflect variable feeding conditions, although breeding success of

murre was high (ca. 70-80%) at all three colonies in 1995.

DIET AND PRODUCTIVITY OF PIGEON GUILLEMOTS IN ALASKA

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We measured growth rates, nestling provisioning rates, and nesting success in relation to diet of Pigeon Guillemots in two years (1994 and 1995) at three sites in south-central Alaska (two in Prince William Sound [PWS] and one in Kachemak Bay). Sand lance dominated the diet in Kachemak Bay in both years, whereas in PWS, juvenile pollock and/or juvenile herring replaced sand lance as the major forage fish in guillemot diets. Near-shore demersal fishes (blennies, sculpins) varied from 27-61% of the diet. Nestling growth rates were highest when herring predominated in the diet and lowest when pollock predominated, with intermediate growth rates on sand lance diets. These trends are in agreement with published values for energy densities of these forage fishes. While overall nesting success was strongly influenced by site-specific differences in predation rates, nestling growth rates, nest densities, and colony trends appear to be driven by attributes of food supply. We hypothesize that schooling forage fishes, especially sand lance or herring, are crucial for maintaining productive colonies of Pigeon Guillemots in south-central Alaska.

ADAPTATION OR CONSTRAINT: WHY IS THERE A SEASONAL DECLINE IN EGG SIZE IN THE THICK-BILLED MURRE?

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Seasonal declines in egg size are a consistent feature of the breeding biology of alcids. Two hypotheses have been proposed to account for this pattern. The first suggests that it is an adaptive response to breeding in a seasonal environment; birds breeding late minimize the delay in laying by producing smaller eggs. The second suggests that younger, poorer quality

birds are constrained in their ability to form eggs; therefore, these birds lay smaller eggs later in the season. I tested these two hypotheses at a Thick-billed Murre colony at Coats Island, N.W.T., in 1994 and 1995. In both years, a naturally late-laying group of experienced breeders laid their eggs at the same time as young breeders, which was later than experienced breeders elsewhere on the colony. However, the eggs of these late-laying experienced birds were larger than those of young birds, and similar in size to those of the early-laying experienced birds. Egg sizes did not decline with laying date for experienced breeders, but they did for young breeders. These results support the hypothesis that the seasonal decline in egg size results from the later-laying of smaller eggs by young birds.

THE EFFECT OF NUTRITION ON THE GROWTH OF WING FEATHERS IN NESTLING THICK-BILLED MURRES

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Substantial variation exists in the growth rates of nestling Thick-billed Murres both within and between colonies and years. We examined the relationship between growth in body mass and growth in length of wing feathers at Thick-billed Murre colonies in the eastern Canadian Arctic. Significant positive correlations existed between 14 d body mass and 14 d wing length within all samples from individual colonies and years, and also when the means for all colonies and years were plotted together. In partial correlation analyses controlling for initial (2 d) mass, 14 d mass explained a similar proportion of the variation in 14 d wing length at the different colonies. However, the slopes of the regression lines varied substantially, tending to be steeper in samples in which 14 d masses were low. These results suggest that wing growth is closely tied to nutrition across the range of natural growth rates seen in this species. At the upper range of growth rates, however, chicks may be nearing intrinsic upper limits to rates of feather growth. Nutritional effects on feather growth have also been demonstrated in other auks. Caution

needs to be exercised in the use of wing length as a criterion to age nestling alcids.

COLONY LOCATION, PRODUCTIVITY AND COLONY PERSISTENCE: METAPOPULATIONS AND CONSERVATION OF GREAT BLUE HERONS

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A management plan to conserve habitat for Great Blue Herons (*Ardea herodias*) needs to consider not only the present habitat choices of herons but also the rate of colony abandonment, where new colonies may be established, the contribution of each colony to the overall population size, and the productivity of colonies. We present data collected on herons in the Strait of Georgia between 1988 and 1994, and consider it within a metapopulation dynamics modelling framework. Individual heron colonies can be seen as local populations linked together by immigration. Using this framework and data we ask: Which colonies are more important for the persistence of a healthy metapopulation? Are some colonies more worth saving than others? Where have new colonies been established? What factors lead to abandonment of colonies? Which habitat features are associated with productive colonies? With less productive colonies? We estimate annual productivity per nest, and turnover of colonies, and explore factors that may be responsible for the considerable variation in the size of heron colonies, from single nests to colonies of several hundred nests. Finally, we discuss our results in the context of conservation and habitat management.

IDENTIFYING AVIAN DIET, FEEDING SOURCE AND ROLE OF ENDOGENOUS RESERVES THROUGH STABLE ISOTOPE ANALYSIS OF EGGS

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Eggs can be analyzed for stable-isotope ratios to provide dietary information that may be used to link diet of laying females. Various egg components can provide dietary information based on periods



ranging from about a day (e.g. albumen, shell carbonate) to a week (egg yolk). In addition, some species may mobilize stored proteins and lipids from endogenous reserves during egg formation and this may be assessed if birds move between foodwebs with distinct isotopic signatures. The isotopic approach is illustrated using isotopic investigations of captive birds raised on controlled diets and of wild birds (*Phalacrocorax auritus*, *Larus argentatus*, *Sterna caspia*) that migrate between marine and terrestrial biomes using a variety of stable isotopes ( $d^{13}C$ ,  $d^{15}N$ ,  $d^{34}S$  and  $dD$ ). Whereas  $d^{15}N$  measurements may provide information primarily of trophic level,  $d^{13}C$ ,  $d^{34}S$  and  $dD$  measurements reveal important information on source of feeding and origin of endogenous reserves.

#### FORAGING ECOLOGY OF PLANKTIVOROUS AUKLETS IN AN ALEUTIAN ISLANDS' PASS

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We tested the hypothesis that the spatial distributions of Least, Crested and Parakeet Auklets in a shallow pass through the Delarof Islands reflected physical forcing of prey distributions. We recorded numbers of foraging birds, currents, using an Acoustic Doppler Current Profiler, and zooplankton distributions, using echosounders. Zooplankton species composition was sampled using a multiple opening/closing net. Prey choice of birds was ascertained by collecting feeding birds. For all three auklet species, we found that the number of foraging birds present was a function of tidal speed. Regardless of tidal direction, Crested Auklets foraged on euphausiids upwelled on the upstream side of the pass, whereas Least Auklets consumed copepods concentrated in near-surface convergences on the downstream side. Parakeet Auklets foraged over the shallowest portion of the pass, taking fish and invertebrates. Along transects, local convergence strength was predictive of the numbers of Least Auklets present in a region, divergence strength

was predictive of Crested Auklet numbers, and absolute strength of shear predicted Parakeet Auklet numbers. Auklet prey preferences dictated where they foraged and which physical mechanisms were exploitable for successful foraging.

#### BLACK-LEGGED KITTIWAKES IN PRINCE WILLIAM SOUND - SIX YEARS AFTER THE EXXON VALDEZ OIL SPILL

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We have recorded size and productivity (number of chicks fledged per nest) at 24 Black-legged Kittiwake colonies in Prince William Sound (PWS) for 12 years. During the Exxon Valdez oil spill, the area around 10 of these colonies was oiled and the area around 14 of these colonies was not oiled. Productivity for colonies in the oiled and unoled areas has been lower post-spill than pre-spill. Lower post-spill chick growth rates and fewer two-chick broods fledging indicate that there has been less food available to kittiwakes in PWS post-spill than pre-spill. We also have anecdotal data indicating predation may have been higher in some post-spill years than in pre-spill years. Productivity at other kittiwake colonies in the Gulf of Alaska is not correlated with productivity of PWS kittiwakes, which suggests that factors limiting productivity affect PWS kittiwakes differently than kittiwakes in other parts of the Gulf of Alaska.

#### DISTRIBUTION OF WINTERING SEABIRDS ALONG FLORIDA'S GULF COAST

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Florida's Gulf Coast represents an important but little studied area for local and migrating wintering seabirds. For example, some of the largest concentrations of wintering Common Loons in N.A. are found along Florida's northern Gulf Coast. The Florida Game and Fresh Water Fish Commission, Bureau of Nongame Wildlife, conducted aerial surveys during the winter of 1992/93 to document distri-

bution of selected seabirds (Common Loons, Northern Gannets, Double-crested Cormorants, Brown and White Pelicans, Brown and Masked Boobies, and Magnificent Frigatebirds). Approximately 2700 km of aerial transects were flown from December through March, resulting in 1,390 observations of 8,319 birds from the selected species. Double-crested Cormorants were the most abundant species overall, with loons ranking second. Relative abundance of the selected species was greatest in the north-eastern Gulf and least along the exposed Southwest coast. Relative abundance of most species varied among months within areas. Intraspecific relative distribution was similar over time within an area, although distribution of loons did vary significantly in the northern Gulf. The feasibility of using aerial surveys to monitor the more abundant species is discussed.

#### USING STATISTICAL POWER TO DETERMINE THE FEASIBILITY OF MONITORING MARBLED MURRELETS

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A common goal in the conservation of avian species is to monitor populations for biologically and statistically meaningful changes across either space or time. While a well-designed monitoring program can provide valuable information on the effects of recovery or management plans, a poorly-designed program can waste time and money, and even deliver misleading data. A critical component in the development of a monitoring program is the accurate estimation of variability in the population being studied. We measured variability in daily detections of Marbled Murrelets at old-growth forest sites in the Oregon Coast Range to test the feasibility of using current survey protocol for long-term monitoring. These data were used in a power analysis procedure to estimate the number of surveys necessary to detect a range of trends in Marbled Murrelet detections for stated degrees of statistical



confidence. Our data indicate that, for the sites we studied, the current protocol of 4 surveys/yr for 2 years is rarely adequate to detect a biologically meaningful decrease in detections. We examine other Marbled Murrelet survey data and discuss possibilities for long-term monitoring.

# THE EFFECTS OF HUMAN DISTURBANCE ON TIME ALLOCATION OF NESTING LEAST TERNS (*STERNA ANTILLARUM BROWNI*)

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From 1990 to 1991, I studied the effects of human disturbance on time allocation of California Least Terns (*Sterna antillarum browni*) nesting at two colonies at Camp Pendleton, San Diego County, California. Least Terns spent most of their time at the nest engaged in normal incubation (mean 82.1% occurrence), followed by alert incubation (3.6%), sleeping (3.3%), and vacant (11.0%). To determine the effects of human disturbance on time allocation, I selected two study sites that differed in the amount and type of disturbance. Behavioral differences between sites were significant. Normal incubation, sleeping, and brooding categories made up a significantly larger proportion of the tern behavior at the undisturbed site than at the disturbed site. Birds at the disturbed site were more likely to be vacant from the nest and incubate alertly than at the undisturbed site. Helicopter flights were the most numerous potential disturbance, and a monitoring group caused the longest duration of a disturbance. Although the effects on chick survival should be evaluated, habituation to disturbance may enable Least Terns to adapt behaviorally to a host of potential disturbances.

# DISTRIBUTION, ABUNDANCE AND BEHAVIOR OF XANTUS' MURRELETS OFF NORTHERN CALIFORNIA AND SOUTHERN OREGON

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We studied the pelagic ecology and distribution of the Xantus' Murrelet (*Synthliboramphus hypoleucus scrippsi*) between 43(N and 35(N, from the coastline to the offshore limit of its range. We sighted 125 murrelets during continuous strip-transects on 19 cruises from 1986 to 1995. Murrelet distributions showed distinct seasonal patterns relative to oceanographic variables and distance from land. During spring/summer, murrelets were inshore with highest densities on the continental slope west of the Farallon Islands in upwelled mixed waters. In the fall/winter murrelets were found in highest densities further south between Point Sur and Point Buchon in offshore oceanic waters. Murrelet "group-size" ranged from singles to foursomes. Pairs were sighted more frequently than expected ( $P < 0.0001$ ). Pelagic population for the study area was estimated to be 1,500-2,250 for spring/summer and 2,5[PC1]00-3,560 for fall/winter (95% CIs will follow). Obtaining population estimates from at-sea counts and assessing its pelagic distribution and habitat preferences will further our ability to monitor the status of this species and to evaluate its sensitivity to natural or anthropogenic environmental disturbances.

# COMPARISON OF SUMMER MARINE BIRD POPULATIONS IN 3 AREAS OF ALASKA

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During the summers of 1993 and 1994, we conducted surveys to estimate marine bird populations in Lower Cook Inlet (LCI; June 1993), Prince William Sound (PWS; July 1993) and Southeast (SE; June-July 1994), Alaska. We used small boats to survey randomly-selected transects in 2 strata: shoreline ( $< 200\text{m}$  of shore) and pelagic ( $> 200\text{m}$  of shore). We used a ratio estimator to calculate population estimates. Total marine bird populations ( $+ 95\%$  CI) were 798,041  $\pm$  195,555 birds in LCI, 371,327  $\pm$  58,189 birds in PWS, and 1,924,662  $\pm$  568,894 birds in

SE. Because of differences in area between study sites, it is better to compare densities (57.9; 41.3; and 54.3 birds/km<sup>2</sup> for LCI, PWS, and SE, respectively). The most abundant species group was alcids in all 3 areas (38% LCI, 51% PWS, and 59% SE). These were mostly murres in LCI (56% of alcids) and *Brachyramphus* murrelets in PWS (85%) and SE (61%). In LCI the next most abundant groups were tubenoses (35%) and gulls (16%). In PWS and SE, the next most abundant groups were gulls (29% PWS and 12% SE) and waterfowl (7% PWS and 16% SE). We believe these differences are due to habitat. LCI is different in having more open ocean areas than PWS and SE, which have more shoreline, bays, fjords and islands.

# A GUILLEMOT INTRASPECIFIC PHYLOGENY: INFERRING POPULATION HISTORY FROM PATTERNS OF GEOGRAPHIC VARIATION IN CEPHUS MITOCHONDRIAL CONTROL REGIONS

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Geographic structure in a gene pool is the signature of microevolutionary processes occurring at the population level. Describing such 'genetic architecture' is useful for 1) reconstructing population history and biogeographic events, 2) understanding modes of speciation, and 3) making informed decisions on population conservation and management. We assayed sequence variation in the mitochondrial control region (1 Kb) for several birds from each of 8 *Cephus* subspecies using direct sequencing and analysis of single-stranded conformational polymorphism. Species-level results to date indicate that 1) pigeon and spectacled guillemots are more closely related than either is to Black Guillemots (consistent with the most plausible biogeographic scenario), and 2) hybridization and introgression may occur between Pigeon and Black Guillemots in areas of sympatry. This work is part of an ongoing study of phylogeography and modes of speciation in the genus *Cephus*.

# INTRASPECIFIC KLEPTOPARASIT-

ISM IN A BREEDING COLONY OF THE HERRING GULL (*Larus argentatus*)

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We studied feeding behavior of Herring Gulls at a colony in the Gulf of Finland in 1993-94. The study colony is a stable colony of about 130 pairs, where the chicks are mostly fed on fish. In addition to the breeding pairs, between 1 and 15 non-breeders (most in their 4th to 5th year) were present in clubs in part of the colony. These birds, in addition to neighboring pairs, engaged in food thefts from feeding families. In 1993, 24% of all feedings ( $n=360$ ) observed were disturbed by kleptoparasitizing gulls, while 19% of all observed feedings in 1994 ( $n=146$ ) were disturbed. Success rates for kleptoparasites were 8% and 9%, respectively ( $n=87$  and 34 detailed cases). Most kleptoparasites (73% in 1993 and 77% in 1994) were non-neighbor birds, of which most were in their 4th to 5th year (63% in 1993 and 65% in 1994). Occasionally kleptoparasites took small chicks. Most small chicks less than 10 days old dying simply disappeared, and were likely taken by kleptoparasites. Kleptoparasitizing non-breeders may be important predators within colonies, and kleptoparasitism may be the route via which cannibalism in its specialized form arises.

## NEST SITE PREFERENCES OF RED-LEGGED AND BLACK-LEGGED KITTIWAKES ON ST. GEORGE ISLAND, AK.

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Kittiwakes are colonial gulls that nest in clusters on vertical cliff faces. On St. George Island Red-legged Kittiwakes and Black-legged Kittiwakes commonly nest interspersed on a cliff face, however, Red-legged Kittiwakes use narrower ledges ( $x = 12\text{cm}$ ) than Black-legged Kittiwakes ( $x = 21\text{cm}$ ). In 1994 and 1995 I established narrow (10cm) and wide (20cm) artificial ledges on St. George Island to determine

the nest site preferences of both kittiwake species, to determine whether Red-legged Kittiwakes are competitively displaced to narrow ledges by larger Black-legged Kittiwakes, and to determine whether nest sites were limiting to either species. When given a choice, Red-legged Kittiwakes selected narrow ledges and Black-legged Kittiwakes selected wide ledges. Both species of kittiwake preferred ledges located amongst pre-existing nest sites and did not use ledges located on unoccupied cliff faces. I conclude the following: a) Black-legged Kittiwakes do not actively displace Red-legged Kittiwakes to narrow ledges, rather, Red-legged Kittiwakes prefer to nest on narrow ledges. b) nest sites are not limiting to either species of kittiwake on St. George Island, however, nest sites located within established breeding areas are preferred by both species and may be limited.

## RELATIONSHIP BETWEEN PREDICTABILITY OF FOOD AND JUVENILE TRAITS IN PLANKTIVOROUS AND PISCIVOROUS ALCIDS

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At small scales, the distribution of zooplankton is associated with oceanographic features that are quasi-permanent in space and time. However, the distribution of pelagic fish is less predictable at the same scales. Thus, prey availability is more predictable for planktivorous than for piscivorous seabirds. To examine a relationship between predictability of food and juvenile traits in alcids, I tested the following predictions for Crested & Parakeet Auklets (planktivores) and Horned & Tufted Puffins (piscivores): (1) high variability in food availability results in variability of chick food intake, and (2) piscivore chicks have a greater ability to adjust their developmental rate for the rate of food intake than planktivore chicks. Results of laboratory experiments and field observations indicated that: (1) age of chicks had a significant effect on food intake in planktivorous but not in piscivorous alcids, and food intake varied significantly between different stages of the chick-rearing period in piscivorous but did not in planktivorous alcids, and (2)

piscivore chicks had a significantly greater ability to decrease their metabolic rate in response to food deprivation than planktivore chicks; and piscivore nestlings which received less food were able to retard growth of body tissues, skeletal elements and feathers compared to control chicks. Also, piscivore chicks fledged after reaching a fixed developmental stage, whereas planktivore chicks fledged in response to the decrease in the rate of food intake. Alcid chicks have several fitness-related traits which are associated with the predictability of prey. The predictability of food is a major factor in evolution of juvenile histories in these species.

## EVALUATING AERIAL PHOTO COUNTS FOR CENSUSING HERONS ON THE UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE

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The Upper Mississippi River National Wildlife and Fish Refuge contains some of the most extensive riverine forest, shallow open water, and marsh habitats in the upper midwest. The Refuge, which encompasses 261 river miles of the Upper Mississippi River and 125,000 acres of forest and wetland habitat, supports several colonies of Great Blue Herons and Great Egrets. We evaluated the efficacy of aerial photography to census herons. Aerial photo and ground counts were conducted at nine of the 14 colonies on the Refuge in May 1994. Five thousand five hundred and twelve heron nests were counted from the ground and 4,530 nests were counted from aerial photographs (17.8% error). For individual colonies, error in aerial photo counts ranged from 0.5 to 36% (mean=19, SD=14.7) leading to an overall sighting probability of 81%. The mean number of heron nests/colony calculated from ground counts was 612.44 and from aerial photo counts was 503.56 yielding a correction factor for aerial photo counts of 1.22. Layout, rather than size of colonies seemed to affect



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percent error in aerial photo counts. Aerial photo surveys likely provide reliable data on population trend because most nests at colonies can be seen.

### PRELIMINARY RESULTS OF THE 1994 AND 1995 NOCTURNAL BANDING OF CASSIN'S AUKLETS AT TRIANGLE ISLAND, B.C.

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I describe how the ratio of sub-adult (brown-eyed) vs. adult (white-eyed) Triangle Island Cassin's Auklets captured in 1994 and 1995 changes throughout the different stages of the breeding season, how it changes on moonlit nights, and how late in the season breeding brown-eyed bird captures become more numerous. Triangle Island, located 45 km northwest of the north end of Vancouver Island, supports over a million Cassin's Auklets, making it the largest colony of this species in the world. Cassin's Auklets begin their lives with brown eyes. This brown gradually lessens over a three year period until their eyes are completely white. Cassin's begin breeding at 2 to 3 years of age, therefore a small proportion of the breeding population is made-up of birds with brown eyes. Sub-adults are less likely to attend the colony on moonlit nights, making them inferior provisioners for their chicks when compared to birds with more experience. The increased captures of young, inexperienced breeding birds toward the end of the breeding season may help to explain the phenomena commonly reported in the literature of decreased fledging mass, and slower growth-rate (which increases the length of the chick-rearing stage) in the late hatching chicks of various alcid colonies.

### REINTRODUCTION OF ATLANTIC PUFFINS (*Fratercula arctica*) AT FORMER BREEDING SITES IN THE GULF OF MAINE

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To re-establish colonies of Atlantic Puffin to two historic nesting sites in the Gulf of Maine, northwest Atlantic, 1,904 puffin chicks were translocated from Great Island, Newfoundland to Eastern Egg Rock (EER) and Seal Island National Wildlife Refuge (SI) in Maine from 1973-1989. By 1989, 149 of 914 chicks fledged at EER had returned to the Gulf of Maine, 42 of which bred at least once at EER. Five pairs nested at EER in 1981, where the colony increased to 19 pairs by 1985 and remained at 15-19 pairs from 1987 to 1995 without subsequent translocations. Of 912 fledglings released at SI, 155 were resighted in the Gulf of Maine. Seven pairs recolonized SI in 1992 and the colony increased to 25 pairs by 1995. Four years after colonization (prior to recruitment of EER and SI produced young), 88% of the breeding puffins at EER were translocated birds, which contrasts to only 48% of the 40 identified breeding puffins at SI. The higher proportion of non-translocated breeders at SI is likely related to closer proximity of Matinicus Rock and Machias Seal Island, two nearby puffin colonies. Decoys helped to attract prospecting puffins to both restoration sites.

### PARENT-OFFSPRING VOCAL RECOGNITION IN THE THICK-BILLED MURRE (*Uria lomvia*)

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Recognition between parents and young exists in many animal species, when there is a risk of intermingling of adults and/or young. This risk is high for some colonial breeding alcids. We studied the potential for parent-offspring recognition in the thick-billed murre on Coats Island, NWT. Behavioural observations suggested that chicks respond to parental vocalizations; we assessed the ability of chicks to distinguish between the calls of (1) parents and strangers, (2) parents and neighbours, and (3) neighbours and strangers using playbacks in an experimental enclosure. Chicks preferentially approached parental calls over both stranger and neighbour calls from an early age (four days) but made no choice between neighbour and

stranger calls. Chicks likely recognize their parents' calls for successful colony departure and to avoid aggression from conspecific adults.

### DEVELOPING A PRODUCTIVITY INDEX FOR MARBLED MURRELETS: ABUNDANCE, BEHAVIOR AND HABITAT USE OF NEWLY FLEDGED JUVENILES

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How can we monitor reproductive success of a non-colonial, secretive seabird that nests inland? For the marbled murrelet, a productivity index based on juveniles at sea has been proposed. We studied murrelets at 2 sites in 1994 and 4 additional sites (N=6) in 1995 in Prince William Sound, Alaska, where murrelets are relatively abundant. The sites, each with 40-60 km of shoreline, were separated by >20 km, the mean distance radio-tagged birds foraged in 1994, and farther than a radio-tagged juvenile travelled its first 2 weeks at sea. We conducted replicate boat surveys 1-17 June and 17 July - 28 August. Peak juvenile abundance was greater and 1 week earlier in 1995. Among sites, average percentage of juvenile murrelets ranged 2% - 13%, and was positively correlated with adult abundance at the site in June. Sections with juvenile activity were fairly predictable over several weeks. Until mid-August, juveniles occurred singly, <100 m from shore and often near steep shoreline with upwelling. Later, they were more clumped and often in shallow bays. We suggest that juvenile counts reflected local murrelet productivity and that productivity reflected local foraging conditions. If 'optimum' sites also promote higher juvenile survival and their return to natal areas, June counts may reflect both the relative size of the local breeding population and relative success of recruitment from previous years.

### DIETARY OVERLAP AND ITS IMPLICATIONS FOR COEXISTENCE IN A RECENTLY ESTABLISHED ASSEMBLAGE OF NESTING SEABIRDS AT THE BOLSA CHICA ECOLOGICAL RESERVE IN SOUTHERN CALIFOR-



## NIA

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Fish brought to chicks and mates by adult Caspian, Elegant and Forster's Terns nesting at the Bolsa Chica Ecological Reserve in coastal Orange County in 1993 and 1994 were identified and measured from direct observation of food transfers and examination of fish dropped and regurgitated by the birds on the nesting island. Caspian Terns foraged widely, including in fresh waters, and brought in relatively large and diverse prey, mainly Northern Anchovy and Pacific Sardine followed by silversides (Topsmelt, Jacksmelt and California Grunion). Elegant Terns foraged almost exclusively in the ocean and delivered smaller, less diverse prey dominated by Northern Anchovy. Forster's Terns fed mainly in the estuary and adjacent ocean and brought in small, moderately diverse prey, primarily Topsmelt and other silversides followed by Northern Anchovy. Dietary overlap varied among these three terns (and the Black Skimmer, based on a concurrent study) but was reduced overall by a combination of differences in prey composition and size and foraging habitat, so that continued coexistence based on food resource partitioning seems probable.

#### THE IMPORTANCE OF PREDICTABLE PREY AGGREGATIONS REGARDING THE DISTRIBUTION OF SEABIRDS RELATIVE TO THEIR PREY OVER A RANGE OF SPATIAL SCALES

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To determine whether seabirds are distributed according to abundance of prey or predictability of prey, I collected data on the distribution of Common Murres (*Uria aalge*) relative to their prey and to oceanographic fronts off the west coast of Vancouver Island. Since fronts are often fixed in space and constant through time, prey aggregations at fronts can be regarded as more predictable than prey aggregations away from fronts. I found that at a small spatial scale (kilometers) whether fish occurred at fronts had a sig-

nificant effect on murre density whereas the actual density of fish had no effect. From these results I conclude that predictability of prey was more important than relative abundance of prey in determining the small-scale distribution of murre. At a large spatial scale (100s of kilometers) I found that the number of fish aggregations at fronts had a significant effect on large-scale murre density whereas the overall density of fish in a region had no effect. I conclude that at large spatial scales the number of predictable prey aggregations was more important than the abundance of prey in determining which regions of the habitat murre occupied.

#### REPRODUCTIVE HAZARDS TO NORTH PACIFIC ALBATROSS FROM PCBS AND TCDD-EQS

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Freshly-laid eggs of Laysan and Black-footed Albatrosses (*Diomedea immutabilis* and *D. nigripes*) were collected at Midway Atoll 1992 through 1994 and analyzed for chlorinated contaminants including OC pesticides, PCBs, dioxins and furans. Toxicity measured as dioxin equivalents (TCDD-EQs) in eggs were calculated from congener-specific data. Total PCBs ranged from 1.1 to 3.8 mg/kg ww. Calculated TCDD-EQs ranged from 52 - 124 pg/g. A substantial portion (~35%) of the TCDD-EQs in eggs were owing to dioxins and furans, and the balance to PCBs. PCBs in albatross eggs were much less potent than PCBs in waterbirds' eggs of the Great Lakes and other continental inland waters, suggesting an aerial source. Dioxin and furan residues may be acquired from ingestion of partially burned plastics. Hazard indices based on calculated TCDD-EQs suggest Laysan eggs were contaminated near the low adverse effect level (LOAEL) for embryonic effects, but black-footed eggs were well above avian LOAELs. Egg death during natural incubation was 2-3% greater in black-footed than Laysan nests, and 5% fewer Black-footed Albatross chicks were fledged each year in 1994

and 1995. An unusual form of egg shell thinning of unknown etiology was noted in field studies. Low incidences of deformities in hatchlings were noted in 1994 and 1995. Crossed-bill hatchlings were not reported in these populations until the late 1970s in spite of intensive studies between 1957- 1972. Crossed-bills occurred at rates of 1 in 14,000 Laysan and 1 in 7,800 black-footed chicks, and 1 in 300 dead Laysan eggs 1993 - 1995. These rates are below rates in Great Lakes populations of more highly contaminated Double-crested Cormorants and Caspian Terns, but rates in the least contaminated continental populations of cormorants. Although these adverse reproductive effects owing to contaminant exposures to individual albatrosses are confirmed, adverse effects on these albatross populations are deemed to be unlikely at current exposure levels.

#### CHARACTERISTICS OF NINE MARBLED MURRELET NEST SITES IN DESOLATION SOUND, B.C.

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We found nine murrelet tree nests in high elevation (850-1200m) old-growth forests in 1994-1995. Nests were located by tree climbing (n=6), ground searching (n=2) and radio telemetry (n=1). Nest tree species included Yellow Cedar (n=8) and Mountain Hemlock (n=1) ranging from 63-119 cm dbh. Nest site, tree and stand characteristics are presented for the nine nests. Three of the nest sites were active when found and two of these successfully fledged chicks on July 13 and August 21, 1995. Incubation, chick feeding and fledging behavior is described for these two nest sites. One nest site failed in 1995 and nest success was unknown for six nests. While use of high elevation forests is not well documented in other parts of the murrelet's range, on the southern mainland coast of B.C. high elevation forests have suitable nesting platforms for murrelets within 5-15 km of productive marine foraging areas, and provide important nesting habitat for murrelets in this area.

#### POPULATION TRENDS IN COMMON

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### MURRE POPULATIONS FROM CALIFORNIA, OREGON AND WASHINGTON, 1979-1995

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Aerial surveys of breeding sites of Common Murres were conducted from 1979 to 1995 in California, Oregon and Washington. Survey continuity varied among the three areas. Correction factors were used to estimate total numbers of birds. There has been a significant population decline in murres in Washington. Populations varied from 52,000 in 1979 to a low of 860 in 1993. Mean population size per island was 843 birds. In Oregon, population decline was evident from 1979 to 1987 but remained stable since then. Total population varied from 711,881 (an uncharacteristically high number) in 1988 to 48,427 in 1993. Mean population size per island was 7,928. On the central California coast, murres have declined from pre-1979 levels. Largest population of 224,300 occurred in 1982, with the low of 90,326 in 1989. A population decline also has occurred in northern California. Murres showed much variability in colony-site occurrence in all areas.

### ASSESSING THE RISK OF MARBLED MURRELETS TO NEST PREDATION

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We initiated a study to investigate the influence of stand structure, distance from stand edge, proximity to human activity, and the extent of forest fragmentation on the vulnerability of Marbled Murrelet nests to predation, primarily by corvids. We report on data obtained in 1995 from

18 forest stands on the Olympic Peninsula. A total of 108 murrelet nests were simulated by placing artificial eggs or mounted chicks in typical nest locations (moss covered branches >12.7cm diameter, >17m above ground with high overhead cover) and monitoring their disturbance by remote telemetry and cameras placed near nests. Twelve organisms were observed disturbing them. Eight potential predators (Steller's Jay, Gray Jay, American Crow, Common Raven, Northern Flying Squirrel, Townsend Chipmunk, Douglas Squirrel, *Mustela spp.*) disturbed 84 of 108 nests. Corvids were most likely to disturb eggs; mammals primarily disturbed chicks. Chicks were preyed upon at a higher rate than eggs. Commotion associated with photography may have scared some predators from nests. Activity during nest placement did not appear to attract predators, but human scent on cameras and nest limbs may have attracted some mammalian predators.

### REDUCTION OF SEABIRD ENTANGLEMENTS IN SALMON DRIFT GILLNETS THROUGH GEAR MODIFICATION

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Regulations of The Endangered Species Act and the Migratory Bird (MBTA) Treaty Act have triggered increased scrutiny of seabird entanglement mortality in Puget Sound salmon drift gillnet fisheries. The US Justice Department under MBTA requires the commercial gillnet industry to develop and use gear modifications that reduce seabird mortalities in these fisheries. In a 1994 pilot study, four gear modifications were tested versus a control. Monofilament nets with large (10-inch) opaque mesh in the upper portions of the net demonstrated the greatest potential as an alternative gear to traditional monofilament gillnets because they did not entangle seabirds or marine mammals and caught salmon at rates similar to monofilament. Multifilament nets and monofilament nets with dark (red) corks entangled seabirds at rates similar to monofilament. Monofilament nets with 5-inch

opaque netting in the upper net did not entangle seabirds, but were difficult to handle and caught fish at unacceptably decreased rates. This research was expanded in scope in the 1995 sockeye fishery due to requirements of the regulatory agencies and with funding from the US Fish and Wildlife Service. Experimental nets with 10-inch mesh at two depths relative to the surface were compared to a monofilament control and fished throughout the day - night cycle. Results confirm that visual barriers can reduce the incidental capture of alcids in monofilament gillnets.

### COLONIAL WATERBIRD ACTIVITY AND FEEDING BEHAVIOR IN ST. MARTIN PARISH, LOUISIANA USA CRAWFISH IMPOUNDMENTS, WINTER-SPRING 1995

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St. Martin Parish, Louisiana has the greatest area, 8000 ha, devoted to crawfish culture in the world. These shallow, short-hydroperiod managed wetlands are flooded from fall into spring. They have high densities of invertebrate and small vertebrate prey that attract large numbers of migratory and resident colonial waterbirds (cormorants, pelicans, herons, egrets, ibises, gulls, terns, and roseate spoonbills) from adjacent wetlands. Crawfishes are important food items for all species. Maintaining deep water, over 0.5 m, discourages wading birds from feeding away from shores but most impoundments are physically restricted to depths of 0.25 to 0.50 m. Gulls, terns, cormorants and pelicans are not limited by water depth. When impoundments are drained, Great and Snowy Egrets and Little Blue and Tricolored Herons show a preference for stranded fishes. Yellow-crowned Night-Herons and ibises show a preference for stranded crawfishes.

### FORAGING ECOLOGY AND CHICK PROVISIONING IN COMMON TERNS

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1S6, and *Ralph D. Morris*, Dept. of Biol. Sciences, Brock Univ., St. Catharines, Ont. L2S 3A1.

We investigated patterns of foraging and prey delivery among Common Terns nesting in Hamilton Harbour, Lake Ontario during 1991-1995. Telemetry data were collected concurrently with behavioural observations at the colony. Individual males exhibited predictable foraging patterns during a breeding bout, foraging predominately in a single directional bearing. As a group, terns nesting during the same time period utilized the same general foraging areas. However, the locations of foraging areas varied considerably, both over the course of a breeding season and among years. We observed similar patterns with respect to the types of prey delivered to chicks: the species and size distributions of prey differed between 'peak' and 'late' sampling periods within years, and there was significant variability in species composition and modal prey size among years. We will present data on males followed for more than one year to assess (i) the degree to which individuals specialize on certain types of prey and (ii) whether they exhibit foraging site tenacity. Do the patterns of prey composition and foraging locations reflect temporal variation in prey distribution, or differential selection of prey by adults?

**THE EFFECTS OF TICKS (*Ixodes uriae*) ON NESTLING CASSIN'S AUKLETS (*Ptychoramphus aleuticus*) AT TRIANGLE ISLAND, BRITISH COLUMBIA**  
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Cassin's Auklet (*Ptychoramphus aleuticus*) nestlings were found to host the common seabird tick, *Ixodes uriae*, during a study of nestling growth and fledging behaviour. Most nestlings had zero ticks and few nestlings were severely infested. In comparison to an expected Poisson distribution, *I. uriae* were distributed non-randomly among nestlings and among sites with differing soil characteristics. Ticks were less common on nestlings in sites with sandy soil or with dense fern litter and roots. Nestlings with ten or more ticks had slower rates of wing

growth, fledged with shorter wings, reached peak mass at older ages, and fledged at older ages than nestlings with fewer ticks. Wings must be sufficiently developed to enable flight to sea at fledging. Severely infested nestlings probably remained in the nest longer to compensate for the slower rates of wing growth.

#### SEASONAL MOVEMENT PATTERNS OF DOUBLE-CRESTED CORMORANTS IN THE STRAIT OF GEORGIA.

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Six tail-mount and six internal surgically implanted, radio transmitters were attached to Double-crested Cormorants during the spring and summer of 1994. Birds were located at approximately one week intervals from aircraft, boat or during road surveys. Tail mount transmitters proved ineffective. Four birds disappeared, or picked off the transmitters within one day. One bird sat on a nest for 60 days with an active transmitter. The sixth bird was followed near a breeding colony for two weeks. Implanted transmitters were much more successful; all six birds survived for at least 10 months and returned to the colonies where they were tagged. As of August 1995 two birds, one each from Chain and Mandarti Island colonies, near Victoria, remained in the vicinity of the colonies for an entire year. One bird disappeared a few days following the implanting of a transmitter, and spent the winter near a cormorant colony 25 km away. The three remaining birds were lost one day, four months and five months, respectively, following implants and located again in May and June when the birds returned to breed.

#### LOCAL SYNCHRONY IN EGG-LAYING AND REPRODUCTIVE SUCCESS OF MURRES

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Murres are highly colonial, and pairs often nest in dense groups with little or no space between neighbors. At Bluff,

Alaska, breeding success of Common Murres averaged 61% in 1987-1991. Most reproductive failures were due to accidental egg loss or predation by Common Ravens soon after laying. Breeding success was positively correlated with both the number of breeding neighbors and the degree of synchrony in egg-laying with neighbors. Murres bred more synchronously with neighbors than would be expected based on the degree of egg-laying synchrony within the colony as a whole or on study plots of about 25-100 pairs. On St. George Island, Alaska, reproductive success of Thick-billed Murres in 1992-1994 was similar to that of Common Murres at Bluff in 1987-1991 (e.g., breeding success was 55% in 1992 and 61% in 1993). However, their breeding success was only weakly correlated with the presence of breeding neighbors. The relative degree and advantages of synchrony in egg-laying in these two populations will be compared and contrasted.

#### CHARACTERISTICS OF LEAST TERN NESTING IN SOUTH CAROLINA 1989-1995

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Surveys of all historic Least Tern nesting sites were conducted from 1989-1995. Total ground counts were conducted at incubation intervals at each active colony during the 1989, 1990, 1994 and 1995 seasons. A mean of 1,811 nests were counted with the 1995 season being significantly higher than other years. During 1995, seventy one percent of nests were located in only five of the 29 active colonies. The use of building roofs for nesting increased from 14 to 61 percent. The five year colony turnover rate was high at 0.50. There was a 33 percent probability that an active site will be active five years later. The status and management needs of the state's nesting Least Terns is discussed based on the documented dynamics of the population.

#### POPULATION FLUCTUATIONS OF LITTLE EGRETS BREEDING IN THE

CAMARGUE (SOUTHERN FRANCE)

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Population regulation is a central question in the demography of colonial waterbirds. In the Camargue (southern France), over the last 28 years, the number of breeding Little Egrets (*Egretta garzetta*) showed large fluctuations. They have been as low as about 1000 breeding pairs in the mid-eighties, and were then increasing to over 3000 breeding pairs now. Here we report on various factors which could be responsible for these variations. Reproductive success depends both on breeding density and the amount of rainfall in the Camargue during the previous year. However, reproductive success does not contribute to the year-to-year fluctuations in breeding numbers. The main factor involved in the recent changes in breeding numbers seems to be a change in wintering behaviour of Camargue Little Egrets. This might be a consequence of a combination of exceptionally cold winters in the Camargue and conditions for overwintering further south. Thus, both local as well as distant environmental conditions influence the fluctuations in breeding numbers of Camargue Little Egrets.

USE OF MATURE, MANAGED FORESTS FOR NESTING BY MARBLED MURRELETS IN OREGON

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Marbled Murrelets (*Brachyramphus marmoratus*) are primarily associated with unmanaged, old-growth forests (>200 yrs) throughout their range. In western Oregon, however, murrelets have been found nesting in younger, mature (80-199 yrs) forests that were thinned, high-graded, or selectively logged 30-100 years ago. In 1995, 9 of 13 nests found in Oregon were located within these managed forests. Nests were found on large platforms (>14 cm diameter) in large (>76 cm dbh) trees. Two nests were in remnant old-growth (>200 yrs) trees and seven were in mature trees with large platforms created by mistletoe, disease, damage or in open growing conditions. In this paper,

the specific characteristics of these forest stands and the general historical events that played a part in their creation will be summarized. These data indicate that murrelets nest in managed forests; however, habitat quality of these forests, in terms of nest success, has not been assessed.

ESTABLISHING SERUM CHEMISTRY AND HEMATOLOGY REFERENCE RANGES FOR SPECIES OF ALASKAN SEABIRDS; THEIR CLINICAL IMPORTANCE AND THEIR ECOLOGICAL SIGNIFICANCE

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Blood was analyzed from 151 wild marine birds in order to establish reference ranges for clinical pathology and hematology parameters from a healthy, wild population of Pacific seabirds. Of the 13 species studied, nine were from the Alcidae family and the remaining four were from the Phalacrocoracidae, Laridae, and Procellariidae families. Nine of thirteen clinical chemistry parameters varied significantly ( $P < 0.05$ ) between species including alkaline phosphatase (Alk Phos), aspartate aminotransferase (AST), creatinine phospho-kinase (CPK), cholesterol, glucose, lactate dehydrogenase (LDH), total bilirubin (TBili), total protein (TP) and plasma total solids (TS). Significant species differences ( $P < 0.05$ ) exist for the following hematology parameters; white blood cell counts, lymphocyte counts and eosinophil counts. Packed cell volume (PCV), buffy coat estimates (BC), heterophil counts, monocyte counts, and basophil counts did not vary significantly between species. Plasma calcium concentration, triglyceride levels and total solids varied significantly ( $P < 0.05$ ) between sexes with female birds having higher mean concentrations of all three parameters. However, no statistically significant correlations

between measures of breeding condition (brood patch size, subcutaneous and mesenteric fat deposits, or ovarian follicle size and ovary weight) and calcium or alkaline phosphatase concentrations in female birds could be identified. Alanine aminotransferase (ALT) and uric acid (UA) are the only analytes which did not differ significantly between species or sexes. A description of the clinical significance of these analytes, as well as the biological and ecological significance of these findings will be presented.

SEABIRDS OF THE EAST COAST OF THE USA: STATUS, TRENDS, AND THREATS

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The east coast of the USA is low-lying, with extensive barrier beaches, no cliffs, and few small islands except in the Gulf of Maine. Breeding seabirds include about 500,000 pairs of 23 species, mostly gulls, terns and cormorants. Several million seabirds of 70 species (including loons, grebes, and seaducks) visit inshore or shelf waters in non-breeding seasons. Most of the breeding species are increasing; only three breeders and two non-breeders appear to be decreasing. Many of the increases are long-term recoveries from human depredation in the nineteenth century, and/or recoveries from effects of toxic chemicals or other adverse factors in the 1960s. The most important long-term threat is probably global climatic change. The most important current threats are intensive human development and use of the coast, including promotion of gulls and other predatory species. Oil and human fisheries are probably less important as threats to seabirds than in other areas; net effects of human fisheries are probably positive. Threats to seabirds are mitigated by management, especially focused on terns and pelicans.

POPULATION DYNAMICS AND DEMOGRAPHY OF CORMORANT SPECIES ON SOUTHEAST FARALLON ISLAND, 1971-1995: TRENDS AND THEIR POSSIBLE CAUSES

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We summarize and contrast twenty-five year population trends for three Cormorant species breeding on Southeast Farallon Island: Brandt's Cormorants (*Phalacrocorax penicillatus*), Pelagic Cormorants (*P. pelagicus*), and Double-crested Cormorants (*P. auritus*). For Brandt's and Pelagic Cormorants, breeding population numbers have varied moderately from year to year, except for major El Niño-Southern Oscillation events. During such events, breeding numbers dropped drastically to very low values; in subsequent years, numbers have recovered but not to their previous levels. The result has been a "descending staircase" of population size. As a result, Brandt's Cormorant populations in the 1990's are one-third and Pelagic Cormorants are one-fifth the size of what they were in the mid 1970's. In contrast, breeding numbers of Double-crested Cormorants showed a steady increase in the 1970's and 1980's and are stable in the 1990's. For the two declining species, breeding probability and reproductive success fluctuate strongly, tracking environmental conditions. In addition, adult (and possibly juvenile) survival is strongly correlated with environmental conditions. Consequently Brandt's and Pelagic Cormorants are poorly buffered with respect to environmental variability. Demographic parameter values for Brandt's Cormorants have been incorporated in an age-structured population dynamic model, which confirms the vulnerability of this species to poor environmental conditions, and, conversely, the species' capability for rapid population growth under favorable conditions. We discuss also the difficulty that fluctuations in breeding probability present for monitoring adult population size.

#### ALTERNATIVE FEEDING RESOURCES DURING PERIODS OF SHORT FOOD SUPPLY AND THE INFLUENCE ON THE BREEDING BIOLOGY OF A SPECIALIZED SEABIRD, THE AUDOUIN'S GULL: AN INTER-COLONY COMPARISON

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Spain, Juan Jiménez, and Javier García-Gans, Conselleria de Medi Ambient, Generalitat Valenciana, Ap. de Correos 22105, 46011 Valencia, Spain.

The diet and breeding biology of two colonies of Audouin's Gull *Larus audouinii*, the Columbretes Islands and the Ebro Delta, were compared. The distance between the two colonies is just 80 km, but while Columbretes Is. are ca. 60 km off the coast, the Ebro Delta colony is on the mainland, placed in a river delta ecosystem. In both colonies, the feeding ecology of the species largely depends on the exploitation of discards from the local trawler fleet. Since 1991, a yearly trawl moratorium has been established in the area, overlapping with the Audouin's Gull breeding season. During the moratorium food is in short supply, also because in recent years, the prey on which Audouin's Gull is specialized (clupeiforms), is depleted. In these moratorium periods, the availability of alternative feeding resources was higher in the Ebro Delta than in the Columbretes Is. Gulls in the Ebro Delta could feed on rice fields and occasionally on olive groves and refuse tips, and they performed interspecific kleptoparasitism on smaller seabird species breeding there. In contrast, in the Columbretes Is. these foraging resources were not available or far from the colony. These differences in alternative feeding resources produced higher breeding performance in the Ebro Delta than in Columbretes Is., and they suggest that effects of short food supply may vary not only between species, but also between colonies.

#### THE INFLUENCE OF TRAWLING FISHERY ACTIVITIES ON EGG PRODUCTION IN THE LESSER BLACK-BACKED GULL *Larus fuscus* IN WESTERN MEDITERRANEAN

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The high availability of trawler discards is likely to have a pronounced effect on the reproduction of seabirds, but this importance is normally difficult to quantify. A comparison between two breeding seasons of the Lesser Black-backed Gull, one of them affected by a trawler moratorium,

has allowed an assessment of the effects of discard availability on its egg laying. When trawlers operated, diet was dominated by fish from discards, while during trawler moratorium gulls fed from refuse tips, olive groves and, especially, rice fields. Although breeding phenology was not different, and clutch size was not significantly lower in the year with trawler moratorium, the mean egg volume decreased significantly, showing the importance of trawler discard availability as a proximate determinant of egg production by scavenging seabirds.

#### SEABIRD/FORAGE FISH INTERACTIONS IN PRINCE WILLIAM SOUND: PRELIMINARY RESULTS

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We monitored seabird/forage fish interactions by conducting systematically arranged transects in three areas of Prince William Sound from 21 July-11 August 1995. Hydroacoustic and bird-observation data were collected simultaneously. We collected data on foraging behavior and kleptoparasitism on 22 foraging flocks encountered while following transects. Walleye pollock made up >90% of the forage fish biomass; however, only a few tufted puffins were associated with pollock schools. Black-legged Kittiwakes, Pigeon Guillemots, and Marbled Murrelets were observed in shallow water near (<2 km) shore. Foraging flocks were associated with capelin, sandlance, and juvenile herring. In the 18 foraging flocks that contained Black-legged Kittiwakes, Marbled Murrelets were also present, suggesting a strong association among the two species. Rates of inter- and intraspecific kleptoparasitism were moderate to low and we speculate that there was minor impact upon the victimized species or individuals.

#### ECOLOGY OF BREEDING CASPIAN TERNS IN ELKHORN SLOUGH, CALIFORNIA

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During 1992, Caspian Terns returned to breed in Elkhorn Slough, California after a 12 year hiatus. From 1993 through 1995 my study examined food habits, activity patterns, and population size of breeding pairs and their young. Observations occurred three to six times per week during the breeding season from an observation blind. Adults and chicks were counted twice per observation session. During 1994, dominant fish species fed to chicks were Northern Anchovy (*Engraulis mordax*) 49%, Shiner Surfperch (*Cymatogaster aggregata*) 29%, Topsmelt (*Atherinops affinis*) 19%, and Pacific Staghorn Sculpin (*Leptocottus armatus*) 3% (n=119). Mean adult foraging times to feed chicks were (x=35.25 minutes, SD=34.9, n=67) during 1994 and (x=31.93 minutes, SD=30.21, n=86) during 1995. During 1993, the population was estimated at 100 breeding pairs and about 120 chicks. During 1994, the population increased to about 200 pairs and 150 chicks. During 1995, the adult population remained at 200 pairs; however, due to failure of egg hatching and high mortality, only seven chicks fledged. Toxicology tests are currently being conducted to determine reasons for this decline.

#### NESTING POPULATIONS OF COLONIAL WATERBIRDS IN COASTAL NORTH CAROLINA, 1900 - 1995

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The earliest modern records of nesting colonial waterbirds in North Carolina are found in the first edition of Birds of North Carolina published in 1919. From 1919 until the early 1970s knowledge of nesting populations was based on occasional brief reports. It was not until 1975 that there was a coastwide survey of all nesting species at all sites. Additional surveys were completed in 1983, 1993 and 1995. In 1919, only 13 species nested. Ten new species have colonized the state since that time. Little Blue Herons, Tricolored Herons, Laughing Gulls, Common Terns, Least Terns and Royal Terns appeared

relatively abundant during the early 1900s. Least Terns apparently declined significantly during the late 1800s due to plume hunting but have recovered and stabilized since the 1970s. Royal Terns and Laughing Gulls remain abundant. Great and Snowy Egret populations have recovered from the effects of plume hunting and now appear stable. Brown Pelican, Cattle Egret and White Ibis populations are growing rapidly, while nesting numbers of Glossy Ibis and Black Skimmers are erratic, and Gull-billed Terns may be declining.

#### COINCIDENT COMMUNICATION: EAGLES, EGG PREDATORS, AND ALARMS

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Alarm calls are broadly similar signals across a diverse range of taxa. Many species use more than one call, depending on the type of predator and/or level of threat immediacy. In Pacific Northwest seabird communities, some species (e.g. Larids) give alarm calls, while others (e.g. Alcids) do not. On Tatoosh Island, Glaucous-winged Gulls and Common Murres are the two most prevalent surface nesters, and share the Island's only ubiquitous predator, the Bald Eagle, in common. In response to the appearance of eagles, gulls will only give alarm calls, accompanied by flight, when the raptor is directly over the island. Thus, gull flight alarm is an unambiguous signal of an eagle threat. To determine whether murres use this acoustic signal I designed a playback experiment to test the responses of nesting murres to a variety of gull and murre sounds. Murres treated gull flight alarm as significantly different from any other sound, and usually responded by leaving the colony. Response latency, although not level, was affected by reproductive investment. Because raptor-facilitated egg predation is chronic in this system, signal manipulation (e.g. social attraction, habituation) may prove to be a useful restoration technique in the future.

#### SLOW RECOVERY OF WADING BIRD POPULATIONS AFTER OIL SPILL

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In January 1990, 2,146,000 l of #2 grade oil were released into a narrow tidal strait separating New York City from New Jersey. Up to 1500 pairs of Ciconiiformes have nested on islands in this waterway since the mid-1980s. I compare abundance, timing of nesting, productivity and offspring mortality factors of four wading bird species during the 1990-1993 breeding seasons to similar data collected in 1986-1989. Tidal foraging species (Snowy Egret, Glossy Ibis) produced 35-50% fewer fledglings in 1990-1993 compared to pre-spill. Greater nestling starvation and lower growth rates characterized tidal wading birds post-spill. In contrast, productivity of generalist and non-tidal wading birds (Black-crowned Night-Heron, Cattle Egret) did not differ before and after the spill. Relative importance of mortality factors of non-tidal Ciconiiformes also did not vary over the study period, although night-heron diet shifted immediately post-spill to include less fish and more human refuse. I conclude that reduced productivity of tidal Ciconiiformes resulted from a critical loss of tidal resources in the estuary as a result of oil contamination. Snowy Egrets were most sensitive to the perturbation. Productivity dropped from 1.7 fledglings per nest during 1986-1989 to 0.5 during 1990-1991 and began to rebound during 1992-1993 (1.2 fledglings/nest).

#### EMPLOYING GENETIC MARKERS TO INVESTIGATE BEHAVIORAL AND LIFE HISTORY TRAITS OF THE SPECTACLED EIDER

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In 1993, the Spectacled Eider was listed as Threatened in North America. As part of ongoing population monitoring and nesting ecology research, samples of blood, nest feathers, and egg shell membranes were collected in Alaska and Russia. Using genetic markers called microsatellites, these materials provide information on behavioral and life history traits not easily detected with traditional



research methods (e.g., long term banding and observation). Microsatellite markers allow a minimally disruptive research protocol and more expedient results: Desirable project attributes in endangered species research. The polyallelic character of microsatellite DNA provides consistent individual "fingerprinting", used in estimating degree of adult and natal philopatry, interannual nest placement, and survival. The Mendelian transmission of microsatellite loci enables quantification of relatedness among individuals and frequency of pre-hatch and post-hatch brood amalgamation.

#### CONTAMINANT LEVELS AND INCREASED BREEDING POPULATIONS OF GREAT BLACK-BACKED GULLS ON THE GREAT LAKES

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The Great Black-backed Gull was first report breeding in the Great Lakes in Lake Huron 1954: a single pair at one location. In the 1980s, single pairs of black-backed gulls were found nesting at several sites in Lake Ontario, and a "colony" of 3-5 pairs bred there annually at Little Galloo Island. Up to 12 confirmed or probable breeding attempts at 8 sites were reported recently for Lake Huron and the first nestings on Lakes Erie and Michigan have been reported. In 1995 on Lake Ontario, Pigeon and Little Galloo Islands each supported 10 pairs of black-backs. Predation on Caspian Terns at Pigeon Island in 1995 appeared heavy. Contaminant levels were measured in fresh eggs of Herring and Great Black-backed Gulls from Lake Ontario in 1993-94. Levels of DDE, total PCBs and mirex in Black-backed Gull eggs (12.8, 26.3 and 2.0 ppm, wet weight, respectively) were more than twice the levels found in Herring Gull eggs (6.3, 11.7 and 0.97). Contaminant levels in Black-backed Gulls appear to represent a trophic level above Herring Gulls.

MEASURING THE DYNAMICS OF A COMPLEX OF ROOKERIES IN THE ATCHAFALAYA DELTA, LOUISIANA  
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The rookery complex on the Atchafalaya River Delta, Louisiana contained 10 species nesting in 1994 and 9 species nesting in 1995. The numbers of large waders of each species changes rapidly and drastically throughout the season on this area. As much as 70% of the nests disappear in a month during the peak of the nesting activity. A major need is to develop procedures to quantify the highly dynamic nature of these rookeries. A combination of field techniques and statistical modeling will be used to address this problem.

#### CONSERVATION BIOLOGY AND THE WESTERN GULL

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The Western Gull, *Larus occidentalis*, may be the rarest gull in North America, with a world population of less than 50,000 pairs which breeds entirely along the Pacific Coast of North America. All other North American marine birds with comparably-sized populations are the subject of conservation efforts. Western Gulls are subject to numerous threats: 1) pesticide contamination in Southern California, 2) extensive hybridization with the much more numerous Glaucous-winged Gull in Washington, 3) recurrent El Nino like conditions over the last 15 years in the NE Pacific, and 4) the largest colony (containing about 30% of the world population) of this species is on Southeast Farallon Island, which lies in a major shipping channel. Perhaps most serious, ornithologists and the scientific community appear to regard Western Gulls as a pest, and protect other, more common, marine and aquatic birds at the expense of Western Gulls: 1) Southeast Farallon, PRBO regards Western Gulls as a threat to Cassin's Auklets and Leach's Storm-Petrels, 2) Washington, U.S. Fish and Wildlife Service protects Tufted Puffins and Rhinoceros Auklets, and 3) San Francisco Bay, National Park Service works to protect Black-crowned Night-Herons

from Western Gull predation. All of these "protected" species have world populations orders of magnitude higher than Western Gulls.

#### MEANS, VARIATION, AND LIFE HISTORY EVOLUTION IN MARINE BIRDS

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The basic model of life history evolution is Lotka's fundamental equation, which assumes a tradeoff between current reproduction and survival or future reproduction. This model uses mean (average) performance of a population to estimate population growth, fecundity, and survival. We argue that although means are useful for characterizing population dynamics, they are of limited use in examining evolutionary questions, particularly with regard to life history evolution. Individual variation in lifetime breeding performance is so great that average birds are not representative of populations. Using data from a 12 year study of long-term breeding performance in Western Gulls, *Larus occidentalis*, we demonstrate that 1) most birds breed only 1-2 times before disappearing, 2) a few birds are highly successful, breeding for 10-12 years and producing 25-30 fledged young, 3) no tradeoff exists between survival and fecundity, because survival is the best predictor of annual and lifetime fecundity, and 4) individual variation in diet choice is a major factor underlying lifetime performance. Using data from other studies to complement our own, we argue that the mean individual beloved of tradeoff theory is likely to be the result of averaging across many failures and a few successful individuals.

#### CENSUS OF TWO FORMS OF MASKED BOOBY BREEDING ON CLIPPERTON ISLAND WITH COMMENTS ON THEIR PHYLOGENETIC STATUS

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In 1958, when introduced pigs were eliminated from Clipperton Island (10°

18°N 109° 13'W) in the eastern Pacific Ocean, the Masked Booby (*Sula dactylatra*) population there numbered an estimated 150 individuals. Using aerial photography we determined that there were 50,543 individual Masked Boobies at Clipperton in 1987 including 23,959 breeding pairs, and in 1990 there were 61,489 boobies associated with the island, including 30,564 breeding pairs. These results indicate that Clipperton Island is by far the largest Masked Booby colony in the world. Two readily identifiable races of Masked Booby currently breed at Clipperton: a yellow-billed form, *S. d. californica*, comprising >99% of the population, and an orange-billed form, *S. d. granti*, with an estimated population of 150 individuals (0.2% of the population). Mating between these two forms appears to be assortative at Clipperton Island and at other colonies in the eastern Pacific Ocean where they nest sympatrically, suggesting that speciation may have already occurred. Potential isolating mechanisms between these two forms include bill color, nesting and roosting habitat preferences, and differences in at-sea distribution.

#### HERON STEATITIS IN SOUTHERN CALIFORNIA

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Steatitis, or yellow fat disease, was first seen in both Great Blue Herons and Black-crowned Night-Herons in San Diego in 1979 (1 heron). More than 11 herons had it in 1980; from 1981 through 1990 steatitis was sporadic and low in number of cases. A continuing epizootic began in 1991 (4 herons), then continued into 1992 (15 herons), 1993 (43 herons), 1994 (105 herons), and 1995 (133+ herons). Most of these herons had severe steatitis which is fatal in the wild. Necropsies have been done, and blood and tissue samples are being analyzed for contaminants. Vitamin E values appear normal.

PERIODIC NESTING OF STELLER'S EIDERS (*POLYSTICTA STELLERI*) NEAR BARROW, ALASKA: 1991-1995  
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Steller's Eiders nested near Barrow, Alaska in 1991, 1993, and 1995, but not in 1992 or 1994. Available anecdotal information indicates that this pattern was similar on the Siberian nesting grounds from 1991-1994. Aerial surveys conducted by the U.S. Fish and Wildlife Service throughout possible nesting habitat elsewhere in Alaska did not locate nesting Steller's Eiders. In 1994, at least 68 Steller's Eiders were present near Barrow, however, they remained in flocks throughout the nesting season. Possible causes of periodic nesting at Barrow include the variability of the onset of spring, inadequate food on the wintering or nesting grounds, and variation in the numbers and species of predators present on the nesting grounds. Nesting in Barrow coincided with years in which brown lemming densities were high, which attracted nesting Pomarine Jaegers and Snowy Owls. While it is not known with certainty whether Steller's Eiders nest elsewhere when they do not nest in Barrow, the indication is they do not. Steller's Eiders may live to be 20 years old or older and may maximize their individual life-time reproductive success by not attempting to breed in years when nest survival would be low.

#### POPULATION DISTRIBUTION OF THE MARBLED MURRELET IN SOUTHEASTERN ALASKA, BASED ON A NATURALIST'S LOG

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There has been an urgent need for determining this species' population in Alaska. McAllister's notes, taken during fishing expeditions throughout Alaska from 1981-1993, provide an index to the number seen. More than 7,500 km of

transects were transferred onto a GIS environment, and analyzed on a 10-km grid. We corrected the different intensities of effort during his surveys. Recently on a similar boat, under similar conditions, we compared his ability to see murrelets with that of trained observers. We found that his data varied between total agreement in his intensive mode of survey, to 0.8:1 in what we termed casual observations. We plotted the number of observations per cell, the number of kilometers of transect per cell, the proportion of each cell in water, and the resulting density of birds per cell. We found high densities in Icy Strait, north of Chichigof Island, and Auke Bay. These confirm previous estimates of others. We plan to integrate these data with more offshore work that others have done, and compare the surveys over the past ten years to determine any population trends. While we realize the limitations of these types of data, we conclude that they provide a unique data base, capable of providing information in areas previously unsurveyed, and over a long time period.

#### BETWEEN YEAR VARIATION IN DETECTIONS OF MARBLED MURRELETS AT THREE INLAND SITES IN CALIFORNIA, 1989-1995

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The yearly variation in forest detection levels of the Marbled Murrelet can influence the effectiveness of survey methods. For the past seven years, we have collected data at three inland sites with a range of activity levels. Each site was surveyed a minimum of once per week during the breeding season. Our objective was to determine if there were significant differences in mean detection levels between years. At Lost Man Creek for May through August (28 survey months), no years had mean detections significantly different from other years. At James Irvine Trail and Redwood Experimental Forest, none of the months surveyed showed significantly higher or lower detections over the seven years of surveys. There was no consistent pattern of increase or decrease over all stands in any one year. Because, for individual sites, we found no significant differences



between years and no consistent year effect (for example, all years down in the same year, up in the next), one survey year would be representative of murrelet use of these stands. However, at sites with only one or a few detections per morning, where more surveys have zero detections, more than one year of surveys may be required to adequately determine murrelet use.

#### PATTERNS OF VARIATION IN THE DISTRIBUTION OF MARBLED MURRELETS OFFSHORE OF THE SAN JUAN ISLANDS, WASHINGTON

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During the summers of 1994 and 1995, we surveyed for Marbled Murrelets from small boats in the San Juan Islands of Washington. Surveys were conducted approximately once every 10-day period. In areas of murrelet concentrations, we conducted intensive surveys at 100, 300, 500, and 800 m from shore to determine the distribution of murrelets. We analyzed variations in distribution relative to time of day, tide cycles, distance from shore, between years, and between islands. In 1994, we found that, overall, murrelets were much closer to shore than we had found along more exposed coasts of California, most were within 500 m from shore, with a peak at 300 m. However, we found that along some islands in the same year this peak was at 100 m. This peak also changed between years on the same transect. In 1995, we also conducted some all-day surveys, finding a considerable variation in the number of birds through the day at one site, but little change at another site. We discuss the potential impact of these results, including the need for preliminary studies for adequate survey design.

#### HAWAIIAN STILTS RESPONSE TO HABITAT RESTORATION

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The endangered Hawaiian subspecies of the Black-necked Stilt (*Himantopus mexicanus knudseni*) is found in the Nu'upia Ponds of the Marine Corps Base Hawaii, Kaneohe Bay located on O'ahu. Eight ancient Hawaiian fishponds are bordered by introduced vegetation composed almost entirely of Pickleweed and Red Mangrove. Mangrove and Pickleweed management has been ongoing for many years. Since 1982, the military has used Amphibious Assault Vehicles (AAVs) to break up pickleweed and expose mud surfaces, where stilts nest and feed. In 1987, stilt counts finally exceed those made in 1947 (127 birds). By the 1995, stilt numbers climbed to the highest counts ever recorded in the ponds (150). The stilts using the ponds represents around 10% of the entire Hawaiian population. The recent Legacy Program-funded projects to eradicate mangroves has significantly increased stilt habitat. From December, 1993 to March, 1995 approximately 12.5 acres of mangroves were removed from the Nu'upia Ponds. Stilts quickly exploited modified habitat. In 1995, at least four nests were placed on newly-cleared mangroves shorelines and four nests on artificial nesting islands. In 1996, additional areas will be modified to increase stilt nesting sites.

#### DISTRIBUTION, ABUNDANCE, AND STRUCTURE OF HARLEQUIN DUCK POPULATIONS IN PRINCE WILLIAM SOUND, ALASKA

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In response to mortality from the 1989 T/V Exxon Valdez oil spill, Harlequin Duck (*Histrionicus histrionicus*) populations were surveyed in Prince William Sound (PWS) in 1995 to assess the extent of recovery of ducks inhabiting oiled areas and determine if low reproductive success resulted in changes in age and sex structure of the population. Shoreline surveys monitored abundance, distribution,

population structure, and productivity in oiled and unoled areas. Surveys conducted from early May to mid-June compare temporal changes in abundance and population structure (number of breeding pairs, subadult males, unpaired adult males, and unpaired females), within and between oiled and unoled areas. Breeding pairs were used to evaluate breeding chronology and estimate size of the local breeding population. Plumage patterns in spring were used to age males to 1 of 3 classes (1 yr, 2 yr, adult). Surveys conducted from mid-July through mid-September identify molt chronology and compare changes in sex ratios and abundance. Brood surveys compare productivity. Seasonal changes in population structure throughout the two survey periods provide insight into harlequin duck movements to and from the study area.

#### HOW COSTLY IS CLUTCH FORMATION IN THE AUDOUIN'S GULL?

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To assess female daily and total energy investment in clutch formation for the Audouin's Gull (*Larus audouinii*), we studied the rapid yolk deposition (RYD) period in 24 recently laid eggs belonging to 8 three-egg clutches collected at the Ebro Delta colony. RYD was estimated following the potassium dichromate yolk-staining method of Grau (1976). Stained yolks were photographed and their images were computerized. The number of dark-light bands and their respective volumes were obtained using image processing. RYD lasted 8 days in the Audouin's Gull; the mean volume of dry yolk deposited daily was 1.93 ml, although the rate of deposition was not constant, being higher during the second half of RYD. Total volume of yolk deposited per follicle was 15.24 ml. The maturation of the three follicles lasted from 11 to 14 days, and daily energy investment peaked on day 7 when, on average, up to 8 ml of yolk was

distributed among the three maturing follicles. Differences in RYD and related parameters were not significant at inter- or intraclutch level.

# THERMAL STRESS AND BEHAVIOR OF SOOTY TERNS NESTING UNDER VARIABLE VEGETATION DENSITY

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We examined the relationship between the thermal environment, nest-site selection, and behavior of Sooty Terns (*Sterna fuscata*) at a colony in Culebra Island, Puerto Rico. The objectives were to study terns incubating in shaded and exposed sites to relate microhabitat characteristics to nest-site selection, to determine how operative environmental temperatures of tern mannequins related to microhabitat differences, and to compare the behavioral response of incubating terns to microhabitat differences. Our results suggest that for Sooty Terns at Culebra 1) nest orientation was not critical under vegetation, 2) wind speeds might not be sufficient to maintain homeostasis in exposed areas, 3) shade over the head decreased thermoregulatory behaviors, 4) vegetation cover prevented terns from leaving their nests unattended to cool down, and 5) thermoregulatory behaviors might not be sufficient to maintain homeostasis in young and adult terns in exposed habitats. The selection of a favorable microhabitat under the shade of vegetation must have strong adaptive value for Sooty Terns at Culebra.

# TIME BUDGET OF SURF SCOTER BROODS

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We quantified time budgets of Surf Scoter broods at Lake Malbaie, located in the Laurentide Wildlife Reserve, approximately 96 km North of Québec City. In 1994, the lake harboured 40 breeding pairs of Surf Scoters, the largest and most

southerly breeding concentration known. Over 200 hours of observation were distributed among at least 11 different broods. Duckling feeding bouts lasted longer ( $X=27$  min.) than resting bouts ( $X=20$  min.) and were shortest ( $X=18$  min.) in early afternoon and longest ( $X=35$  min.) in the morning. Resting bouts were longest ( $X=27$  min.) and most variable in early morning and shortest ( $X=14$  min.) in the evening. In general, resting and feeding bouts of females and young were synchronized. Overall, young spent more time feeding than females (58 vs 30%), more time resting (27 vs 18%) but less time in alert (2 vs 36%). Both females and young spent more time feeding and less time resting, in August than in July, possibly a function of brood age. Females spent less time in alert posture in August than in July (29 vs 39%). When the young were resting, the female tended to spend more time resting in the morning (59%) than in the evening (24%). She spent more time in alert posture in the evening (41%), than in the morning (23%). Duckling activity was highly synchronized and transitions between feeding and resting bouts lasted less than 5 minutes. Preening occurred during these transitions and was most prevalent following a feeding bout than after a resting bout.

# A CASE FOR CONCERN? THE EASTERN POPULATION OF BARROW'S GOLDENEYE

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Data on the eastern population of Barrow's Goldeneye is scant. Breeding has not been confirmed yet, in eastern Canada, but recent pairs survey on the Laurentian plateau, along the north shore of the Saint-Lawrence Estuary, suggest possibility of breeding there. Groups of males have been reported at the mouth of some of the inlets, of the North East Labrador Coast, indicating possible moulting location for drakes. Information on winter distribution indicate concentration of several hundred birds, in the Saint-Lawrence Estuary, a few hundred around Anticosti Island and small numbers in the Mari-

times and eastern coastal United States. No reliable data exists, on population trend or size, except that goldeneyes, as a group, are declining in the east. Harvest rate data are unreliable due to small sample sizes. Best estimates suggest that the population may be around 2-3000 birds. Our poor state of knowledge, combined with hunting pressure and logging operations (on potential breeding areas, is cause of concern, for the continued existence of that population.

# CRASH OF COMMON EIDERS AT ONE SITE IN WESTERN ALASKA

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We monitored nesting density and success of Common Eiders at Cape Espenberg, on the northern Seward Peninsula in western Alaska, from 1976-1979 and 1994-1995 using three nesting plots and census transects. In the 1970's, our study area had the highest reported nesting density of these birds in Alaska, and a reasonably high nest success rate (~50%). All three nesting plots and the census transects showed a 80-90% decrease in eider numbers in 1994-95, compared to the 1970's. In addition, nesting numbers in 1995 were lower than in 1994, suggesting a continuing decline. Nest success was essentially nil in 1994-95. Comparable data on Common Eiders from other areas in Alaska are non-existent, making it difficult to determine if this decline is local or widespread. The initial cause of this decline is unknown; predation of eggs may be preventing recovery in this population.

# THE ORNITHOLOGICAL COUNCIL: IN AID OF RESEARCH, EDUCATION AND CONSERVATION

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The Ornithological Council was formed in 1992 by seven leading ornithological societies (AFO, AOU, COS, CWS, PSG, RRF, WOS) to represent professional ornithologists and the science of ornithology in the making of regulations and policies. The Council addresses many issues: working with the Fish and Wildlife Serv-



ice to make regulations which facilitate research and collecting; providing impartial scientific information to federal and state legislators concerning proposed bills; working with the Conservation Committees of the Council's member groups; keeping ornithologists informed of proposals and actions which affect birds; speaking for scientific ornithology on public issues. A few of the issues with which the Council is currently involved: developing a database of ornithological expertise and other means of providing scientific information to decision makers; providing comments to agencies and Congress on Endangered Species issues, including bald eagles, spotted owls, golden-cheeked warblers; working to save the National Biological Service which is being threatened during the current budget cuts; determining the effect on cavity nesting birds of an OSHA regulation concerning cutting snags in forests; helping U.S. FWS write a new, simplified policy on collecting. The Council communicates with ornithologists through its newsletter and on AOUNET.

#### FEEDING ECOLOGY AND AGE DEPENDENCE ON DIET OF THE SOOTY SHEARWATER, *PUFFINUS GRISEUS*, IN THE NORTH PACIFIC

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The diet of the Sooty Shearwater was examined by using a total of 1,139 stomachs of the bird sampled during April-October, 1982, 1985-1989. Predominant prey species was the Japanese Sardine (*Sardinops melanosticta*), the wet weight percentage of which was 57.9% in the Confluence Zone, April-May, and 55.8% in the Subarctic Current, June-September. Other identified prey species were the Pacific Saury (*Cololabis saira*), squid (*Berryteuthis anonychus*), Pelagic Barnacle (*Lepas fascicularis*), and jellyfish (*Vellela lata*). In the Subtropical Zone, June-July and the Transition Domain, June-October, the relative importance of squid and pelagic barnacle as prey items for the bird increased in both frequency of

occurrence and weight. The importance of fish in the diet increased with body weight increment of the bird, while that of squid and barnacle decreased. Body weight of the bird could be related to their growth stage because of their bursal size and annual cycle. It is, therefore, suggested that the diet of the bird changes with their growth.

#### RESTORATION ACTIVITIES FOLLOWING THE EXXON VALDEZ OIL SPILL

Stanley E. Senner, Exxon Valdez Oil Spill Trustee Council, 645 G Street, Suite 400, Anchorage, Alaska 99501.

The civil settlement following the Exxon Valdez oil spill required Exxon Corporation to pay the United States and State of Alaska \$900 million over 10 years to restore injured resources and services lost due to the spill. Uses of the funds are determined by a state-federal Trustee Council, consistent with policies outlined in a Restoration Plan. Projected allocations include \$342-372 million for habitat acquisition and protection; \$118-248 million for research, monitoring, and direct restoration; and \$108 million, plus interest, in a reserve account for use after the year 2001, when the last of Exxon's payments is due. Many of these activities focus on or benefit marine birds, such as acquisition of timbered habitats for nesting Marbled Murrelets and a major research initiative which is attempting to relate forage fish populations to seabird productivity in Prince William Sound. The Trustee Council is supporting construction of part of the Alaska SeaLife Center in Seward, which will provide top-notch facilities (e.g., laboratories and large outdoor tanks) for research on marine birds and mammals. The Pacific Seabird Group is encouraged to continue its participation in commenting on and shaping the Exxon Valdez restoration program.

#### EFFECTS OF MATE-FEEDING AND CHICK-PROVISIONING ON BREEDING PERFORMANCE AMONG KNOWN-AGE ROSEATE TERNS AT FALKNER ISLAND, CT

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Jeffrey A. Spindel, US National Biological Service, Patuxent Environmental Science Center, Branch of Migratory Bird Research, Laurel, MD, 20708.

We hypothesized that mate-feeding and chick-provisioning rates by male Roseate Terns could affect breeding performance in this species, and that the quality of paternal care was related to age. We predicted an inverse relationship between mate-feeding rates at the nest-site and egg-laying intervals, and a positive relationship with clutch size and total clutch mass. We found no such relationship with either measure, nor did we find that mate-feeding rates varied with age of the male. Further, we predicted that chick-provisioning rates would correlate positively with chick growth and survival, a prediction that was supported. Male, but not female, age correlated positively with feeding rates at 29 study nests, and mean age of the male was significantly greater at nests in which two chicks, rather than one chick, fledged. However, chick growth rates and survival were extremely poor in 1995, indicating a year of food stress, which may have affected the "normal" rate of food delivery for both males and females.

#### CHANGING PATTERNS OF SEABIRD DIVERSITY IN THE BERING SEA REGION DURING THE PAST 6,000 YEARS

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The indigenous peoples of Beringia utilized marine birds, fish, and mammals as an important food resource in their subsistence economies, and as a consequence have left behind an invaluable record of past distribution and abundance of resident species. We analyzed vertebrate material obtained by archeological excavations of Aleut, Indian, and Eskimo habitations from sites located throughout the Bering Sea region. Bones were first identified to species and then dated or assigned dates based on proxy material. Ancient nucleic acids still present in the material was extracted and utilized as a source of genetic population markers. We

examined several gene regions, including mitochondrial 12S and 16S ribosomal DNA, non-coding d-loop regions, and the cytochrome B gene. We identified unique patterns of DNA with regional populations and were able to associate significant spatial shifts in the distributions of populations and species with global change in climate and landscape during the middle and late Holocene. For example, Siberian populations of gulls, auklets, and shags expanded greatly with temperature minima, and distributions of many seabirds have contracted since the last 1000 years.

# INCIDENCE AND DETECTION OF NATURALLY OCCURRING VIRUSES IN DOUBLE-CRESTED CORMORANTS IN THE CENTRAL FLYWAY

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Recent advances in molecular techniques are now being tested which allow rapid detection and characterization of naturally occurring viruses of biological and economic importance. We utilized PCR-based probes which we designed to amplify selected regions in Fusion (Fo) and Hemagglutinin-neuraminidase (HN) genes in orthomyxo- and paramyxoviruses. These groups include Newcastle Disease Virus (NDV), Avian Influenza (APIV), Human Croup (CAV), and Human Influenza (HI). Probes applied against blood and tissue samples of field-collected Double-crested Cormorants, White Pelicans, Canada Geese, and White-fronted Geese from Nebraska revealed virus loads ranging from 2% incidence in wild populations (NDV in White Pelicans) to 12% incidence (HI in Canada Geese). Current outbreak of NDV in western Canadian populations of Double-crested Cormorants and widespread prevalence of HI in waterfowl suggest that some waterbird populations may act as disease vectors.

# SEABIRD MONITORING AT ST. LAZARIA ISLAND: NEW BEGINNINGS

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Nine species of seabirds (Leach's and Fork-tailed Storm-Petrels [*Oceanodroma leucorhoa* and *O. furcata*, respectively], Pelagic Cormorant [*Phalacrocorax pelagicus*], Glaucous-winged Gull [*Larus glaucescens*], Common and Thick-billed Murres [*Uria aalge* and *U. lomvia*, respectively], Pigeon Guillemot [*Cephus columba*], Rhinoceros Auklet [*Cerorhinca monocerata*], and Tufted Puffin [*Fratercula cirrhata*]) were monitored at St. Lazaria Island, Alaska, in 1994 and 1995. Population and productivity parameters were examined for most species with additional data collected on chick diets of storm-petrels, auklets, and puffins. A part of the Alaska Maritime National Wildlife Refuge, St. Lazaria Island supports an unusual diversity of seabirds in southeast Alaska. It differs from the rest of the refuge units in having forested habitats used by nesting seabirds. We present the results of the first two years that seabirds have been intensively monitored here and offer comparisons with observations of seabirds made in the 1910's and studies conducted in the 1980's.

# MARBLED MURRELET DISTRIBUTION AND ABUNDANCE IN RELATION TO THE MARINE ENVIRONMENT

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Marbled Murrelets were surveyed daily for 14 weeks each in 1992 and 1993 by boat and from the shoreline in Auke Bay and Fritz Cove, near Juneau, Alaska. Abundance patterns and movements were analyzed in relation to physical variables including season, time of day, tide stage, weather, and water temperature. Season, time of day, and tide height had significant effects on Marbled Murrelet numbers at sea. Numbers were highest on morning boat transects when water levels were highest, regardless of the direction of water movement. For both 1992 and 1993, counts of murrelets on transect and the total number of murrelets were highly correlated with tide height for Season 2 (June 01-August 15), and neither count was correlated with tide height during

Season 1 (May 6-May 31). Surveys conducted from dawn to dusk indicate that, within the hours of daylight, Marbled Murrelet numbers peak in early morning on a high tide. Variability between counts is examined on 3 different scales: between years, between consecutive days, and between counts within a day. These results show that different techniques may be more appropriate for surveys designed to monitor changes in population than for surveys designed to calculate total population.

# GROWTH AND FLEDGING OF ROSEATE TERNS IN EXCEPTIONALLY "GOOD" AND "POOR" YEARS OF FOOD AVAILABILITY

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The growth and fledging success of Roseate Tern chicks at Falkner Island, Stewart B. McKinney NWR, Guilford, CT, in 1994, an exceptionally "good" year in terms of food availability, and in 1995, a year in which food appeared to be abundant during the peak period of laying (late May to early June), but scarce during most of the period of chick growth (late June to mid August) will be compared. At this site, most chick mortality usually results from the death of the second-hatched "B-chick" before it reaches 5 days of age. In 1995, many B-chicks died of starvation after reaching 15 days of age; 4 starved several days after fledging at less than 80 g. These results demonstrate that in the absence of data on "chick quality", "productivity" estimates based simply on "survival to day x" may be positively biased, and they also allow us to predict that the post-fledging survival and recruitment rate into the breeding population of the 1995 cohort from this colony site will be lower than usual.



# AN ESTIMATE OF MARBLED MURRELET PRODUCTIVITY FROM OBSERVATIONS OF JUVENILES ON THE INLAND MARINE WATERS OF WASHINGTON STATE DURING THE 1993 THROUGH 1995 POST-BREEDING SEASONS

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The ratio of young-of-the-year (juveniles) to after-hatch-year (subadults and adults) Marbled Murrelets was monitored by boat in the inland waters of Washington during August of 1993-1995. There was no statistical difference between the juvenile ratios of 9.3%, 7.8%, and 7.9% calculated for 1993, 1994, and 1995 respectively ( $G=0.753$ ,  $P>0.5$ ). Juvenile ratios were higher in the San Juan Islands and along the Olympic Peninsula than in Hood Canal. Surveys were conducted later in the month during 1993 and juveniles were difficult to differentiate from adults that had progressed farther in their prebasic molt. The overall dark coloration was less than 80% for 64.7% of sampled birds in 1993 versus 6.9% and 10.4% in 1994 and 1995. In addition, 77.2% of sampled birds in 1993 had already molted all their primaries, versus only 4.0% and 12.8% in 1994 and 1995. The possible errors associated with using the juvenile ratio as an index for measuring changes in productivity are discussed.

## MATE CHOICE IN PENGUINS: ARE FEMALES INTERESTED IN MALES OR THEIR RESOURCES?

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Studies of the basis of female mate-choice in diverse taxa have produced largely dichotomous results, with some finding that females choose males mainly on the basis of characteristics of the males themselves, and others showing that females base their choices primarily on the quality of resources or territories held by the males. In monogamous species in which males provide extensive parental care and hold reduced territories

which do not provide food for mates or offspring--many seabirds, for example--females may be expected to choose mates based on male traits. In contrast to this expectation, however, we found that Magellanic Penguin (*Spheniscus magellanicus*) females selected males according to the males' resources. Both correlative and experimental results showed that males holding higher quality nests were more successful in attracting females and in retaining their previous mate than were males in poorer nests. The greater attractiveness of males with better nest sites was due to the sites themselves, and not the quality of the males in them. These results, and the opposite finding by others in a study of Adelie Penguins (*Pygoscelis adeliae*) suggest that the primary mate-choice criterion females use depends on the degree to which male-held resources can contribute to female fitness.

## DISTRIBUTION AND ABUNDANCE OF THE CENTRAL CALIFORNIA POPULATION OF MARBLED MURRELETS (*Brachyramphus marmoratus*)

Craig S. Strong, Crescent Coastal Research, 7700 Bailey Rd. Crescent City, CA 95531.

Marbled Murrelets and other seabirds were surveyed using standard marine transect methods at a distance of 400 to 500 meters offshore parallel with the coast. The complete San Mateo and Santa Cruz coasts were surveyed twice, in late June and in mid July, with samples of offshore distribution at 4 locations. Direct counts of birds on the water totalled 154 and 359 for the two surveys, respectively. Relative concentrations of murrelets occurred in Half Moon Bay, south of Ano Nuevo Point, and in northern Monterey Bay. Murrelets were distributed very close to shore (<1000 m), and were only detected farther offshore in areas of concentration. Population estimates for this distinct subpopulation using line transect analyses are discussed.

ALASKA SEALIFE CENTER: NEW OPPORTUNITIES FOR MARINE BIRD RESEARCH, REHABILITATION AND PUBLIC EDUCATION IN THE NORTH  
Kimbal A. Sundberg, Alaska Department of Fish and Game, Anchorage, Alaska,

USA, 99518-1599.

The Alaska Sea Life Center is currently under construction with a scheduled opening date of May 1998. The Center has a three-part mission of research, rehabilitation and public education with a focus on marine mammals, marine birds, fish, and invertebrates endemic to the Northern Gulf of Alaska. The Center is affiliated with the Univ. of Alaska Fairbanks, School of Fisheries and Ocean Sciences (UAF-SFOS) and will have an appointed Science Director from that institution. The facility will be owned by the City of Seward and operated by a non-profit corporation, the Seward Association for the Advancement of Marine Science. Funding for construction the \$49.5 million project has come from the Exxon Valdez oil spill settlement funds and private donations. The Center is located in Seward, Alaska (60°06'N, 149°27' W) on a seven acre waterfront site adjacent to the marine station of the UAF-SFOS Institute of Marine Science. The site is accessible by road, rail, and air from Anchorage and is near large seabird colonies in Resurrection Bay and the Chiswell Islands. The physical plant includes a 79,000 square feet, two-story building housing 2 wet labs, 5 dry labs, 2 special labs, shop, offices, animal quarantine rooms, surgery, necropsy, food preparation and husbandry areas, library, conference rooms, freezers, and public areas. The life support system will draw up to 5,000 gallons per minute of seawater from a depth of 75 meters in Resurrection Bay. The seawater has a salinity of 30-34 parts per thousand and a temperature of 3° to 10° C. A groundwater source will supply fresh water at up to 500 gallons per minute at a temperature of 4° to 6° C. An outdoor research deck encompassing approximately 13,000 square feet will include round and oval tanks, pools, pens, and raceways for holding marine mammals, birds, fish, and invertebrates. Naturalistic habitats encompassing approximately 24,000 square feet will provide for the long term holding and breeding of marine birds, sea lions, seals and sea otters. A marine bird habitat encompassing approximately 3,700 square feet with a 6 meter deep tank will recreate, to the extent possible, a seabird colony in the

Northern Gulf of Alaska with a capacity of over 100 alcids and kittiwakes. The public will have viewing access to the habitats both above and below water, and portions of the research areas in addition to numerous other exhibits interpreting the region's marine life, current fish and wildlife management issues, and research activities. Proceeds from public visitation estimated at 300,000 per year will help offset the operating costs of the Center.

#### MIGRATION OF KING AND COMMON EIDERS PAST POINT BARROW, ALASKA--SPRING AND SUMMER/FALL 1994

Robert Suydam<sup>1\*</sup>, Lori Quakenbush<sup>2</sup>, and Michele Johnson<sup>1</sup>. <sup>1</sup>North Slope Borough, Department of Wildlife Management, Box 69, Barrow, AK 99723, <sup>2</sup>U.S. Fish and Wildlife Service, Northern Alaska Ecological Services, 101 12th Ave. Fairbanks, AK 99701.

King and Common Eiders pass Point Barrow, Alaska during both the spring and summer/fall migrations. We conducted counts to document the species and sex composition and the timing of both migrations and to monitor trends in population sizes. Both migrations are characterized by the arrival of King Eiders followed by Common Eiders five to 15 days later. Eiders appear to be paired when they pass by Point Barrow in the spring. During the summer/fall migration, males appear in mid-July, followed by females in early August and young of the year after early September. Estimates of the numbers of King and Common Eiders were considerably lower in 1994 than estimates from counts conducted at Barrow during the last 40 years; King Eiders numbered ~373,000 in the spring and ~278,000 in the summer and Common Eiders numbered ~71,000 in the spring and ~62,000 in the fall. A previous estimate from 1976 placed King and Common Eider numbers at ~800,000 and ~150,000, respectively.

#### A COMPARISON OF COMMON MURRE (URIA AALGE) POPULATION TRENDS BASED ON DIFFERENT METHODS AT SOUTHEAST FARALLON ISLAND, CALIFORNIA.

William J. Sydeman<sup>\*1</sup>, Harry R. Carter<sup>2</sup>,

Jean E. Takekawa<sup>3</sup>, and Nadav Nur<sup>1</sup>. <sup>1</sup>PRBO, 4990 Shoreline Hwy., Stinson Beach, CA 94970, <sup>2</sup>National Biological Service (CPFC), 6924 Tremont Rd., Dixon, CA 95620, <sup>3</sup>U.S. Fish and Wildlife Service (SFBNWR), P.O. Box 524, Newark, CA 94560.

We use ground/boat (1979-1995) and aerial survey (1985-1993) techniques to estimate the breeding population size of Common Murres on Southeast Farallon Island, the largest colony of the central CA population. In addition, "index plots" (n=9, in which the number of adults are censused during the peak of incubation) and two intensive "study plots" (in which the number of egg-laying sites are determined) provide data for comparisons between all-island and sub-colony population trends. Numbers of breeding murres at the Farallones remain in a depleted state owing to a variety of factors including oil pollution, gill-net mortality, and changes in prey base. Between 1987 and 1989 numbers remained relatively stable at +40-45K. In the early 1990s, however, the population experienced limited growth, interrupted by the 1992 ENSO. As of 1995, the ground/boat survey indicate a population of +65K. Ground/boat survey results are comparable to aerial survey results when counting birds from high vantage points, but aerial surveys are vastly superior (obtaining estimates of 50-100% more birds) when counting from lower elevations or sea level. Index and study plots indicated very slow growth in the late 1980s and more growth in the 1990s, but numbers in only one plot grew substantially. All-island vs sub-colony data provide complementary information. The strength of this long-term monitoring program is with spatial and temporal replication which corroborates whole-colony surveys.

#### STATUS AND CONVERSATION OF COMMON MURRES, URIA AALGE, ON TEURI ISLAND

Takaki Terasawa<sup>\*</sup>, Haboro, Hokkaido, 078-39, and Kouzi Shiomi<sup>k</sup>, Hokkaido Teuri Senior high School, Haboro, Hokkaido, 078-39.

The sizes of breeding populations of five species of seabirds, Common Murres, Spectacled Guillemots (*Ceppus carbo*),

Black-tailed Gulls (*Larus crassirostris*), Slaty-backed Gulls (*Larus schistisagus*) and Japanese Cormorants (*Phalacrocorax filamentosus*) were studied on Teuri Island, situated 28km northwest of Haboro, Hokkaido during 1963-1995. Population size of murres was estimated at 8,000 in 1963, but it dramatically decreased as well as Spectacled Guillemots and Black-tailed Gulls. Population size of murres was estimated at 1,117 in 1972 and 20 in 1995. The main population changes of these two diving seabirds such as murres and Spectacled Guillemots could be attributed to mortality caused by coastal bottom gill net fisheries. Contrary, population size of Slaty-backed Gulls increased, and the number of their nests was estimated at 908 in 1994. Increase of garbage dumped by human would cause their population change. Most of mortality of eggs and chicks of murres and Black-tailed Gulls would be caused by predators as Slaty-backed Gulls. Murres decoys were set at the talus where they bred before because of increase of them. The result of our attempt was that murres visited the site in both 1994 and 1995.

#### SURVIVAL OF JUVENILE BLACK SKIMMERS IN CALIFORNIA

Michael D. Taylor, Dept. of Biology, California State Univ., Long Beach, CA, 90840, and Kathleen T. Gazzaniga, Dept. of Biology, California State Univ., Long Beach, CA, 90840.

Beginning in 1992, individualized color bands were utilized to facilitate more detailed observations of Black Skimmers (*Rynchops niger*) in southern California. Observation sites were set up along the southern California coast (Santa Barbara, Point Mugu, Seal Beach, and San Diego) and in Baja California, Mexico (San Quintin), and weekly observations of these areas were made from September to May, 1992-1995. Survivorship was estimated by resighting banded birds. There was a sharp decline in the survivorship of post fledgling juvenile skimmers during the first 3 months of life. The sharpest decline was measured between the time of banding and the first two weeks of October. Once the birds survived their first winter season, the mortality rate was lower and remained fairly constant. There



was no significant difference between the survivorship curves of the 1992 and 1993 annual cohorts, during the first 9 months ( $2 = 0.519$ ,  $p = 1.0$ )

#### PROTOCOL FOR VALIDATING ACCURACY OF METHODOLOGY FOR CENSUSING SEABIRDS

Christopher W. Thompson\*, Monique L. Wilson, Kirsten Brennan, and William B. Barnett, Washington Department of Fish and Wildlife, Olympia, WA 98501.

Many seabirds are threatened or endangered by detrimental human-related environmental impacts such as loss of breeding habitat, gill net fisheries, and oil spills. Thus, accurate methods for monitoring population sizes of such species are essential. Unfortunately, many existing methodologies for doing so are not based on empirical data, and/or are not designed to be analyzed statistically. In the coastal waters of western Washington, we conducted transects of seabirds to empirically establish a valid methodology for censusing seabird species, especially Marbled Murrelets and Common Murres. Specifically, boat transects were done parallel to shore at different distances from shore, depths from the ocean floor and time of day. Data were collected from multiple localities (e.g., outer Strait of Juan de Fuca and western coast of Olympic Peninsula). Also, simultaneous boat and aerial surveys were conducted to determine the correlation between data collected by these two methods. Our results indicate that appropriate distances/depths for surveying some species differ from those suggested for other geographic areas, e.g. California, indicating that methodologies developed for use in one geographic area should not be used in other areas until they are validated. Additional results and implications of our data will be discussed.

#### SEABIRDS OF THE "PINGUINO DE HUMBOLDT NATIONAL RESERVE", CHILE

Yerko A. Vilina\*, Dept. of Biology, Univ. of Chile, Santiago, Casilla 70061-7, Chile, Juan J. Cappela, and Jorge E. Gibbons, Un Oceano, Casilla 2-58, Santiago, Chile.

Since 1989, the authors have been studying the reproduction of seabirds that

nest in the three islands comprising "Pinguino de Humboldt National Reserve". Eleven seabird species have been recorded nesting on these islands. Ten species nest in the spring-summer season, including the three cormorants present in the Humboldt Current ecosystem (*Phalacrocorax olivaceus*, *P. gaimardi* and *P. bougainvillii*). Chañaral Island is the southernmost nesting place for the *Phaethon aethereus* and was at one stage the biggest nesting colony for the *Pelecanoides garnotti*, an endemic and endangered seabird. At present Choros Island has the largest nesting colony of this species. In Damas Island nests the *Sterna hirundinacea*. The only seabird that nests all year round is the *Spheniscus humboldti*, with two peaks in a year. The authors discuss the breeding seasons and the breeding success of these seabirds.

#### ASSESSMENT OF THE ORIGIN OF AND THE DEMOGRAPHIC IMPACT TO COMMON MURRES KILLED DURING THE TENYO MARU OIL SPILL

Kenneth I. Warheit\*, Department of Fish and Wildlife, Olympia, WA 98501-1091, Burke Museum, Univ. of Washington, and Jack Broughton, Burke Museum, Univ. of Washington.

On July 22, 1991 the *Tenyo Maru* sank 25 miles northwest of Washington State. Following the spill 3,157 oiled Common Murres (2,158 adults) were recovered. To assess the injury resulting from this spill we determined which breeding populations of murres were affected by the spill, and how the demographic features of these populations were altered. We did this by determining the age and sex, and measuring 20 skeletal dimensions for 337 murre carcasses recovered from the spill. We compared statistically these measurements with the same set of measurements from murres of known breeding locality, and concluded that between 55% and 58% of the 2,158 adult murres were from Washington State. Based on an anatomical analysis we discovered that 84% of the adult birds bred or were still breeding that year, and that 77% of the adult birds were males. If the males assumed to be caring for young at sea are removed from the analysis, the sex ratio

for the remaining adults becomes 1:1. Finally, we estimated that between 4,493 and 11,436 adult murres from Washington were killed as a result of this spill.

#### MIGRATORY STRATEGIES OF RADIO-MARKED WESTERN SANDPIPERS ALONG THE PACIFIC FLYWAY: 1995

Nils Warnock\*, ERS/186, Univ. of Nevada, 1000 Valley Rd., Reno, NV 89512, Simon Fraser Univ., Burnaby, B.C. V5A 1S6 and Mary Anne Bishop, Copper River Delta Institute, U.S. Forest Service, Cordova, AK.

In April, 1995 we radiomarked 30 Western Sandpipers at San Francisco Bay, CA (SF), 19 at Honey Lake, CA and 20 at Grays Harbor, WA. We monitored the northward migration of 61 of these birds at 14 sites from SF to the Yukon-Kuskokwim Delta, AK (YK). Fifty-two birds (84%) were detected north of their banding locations, up to 4200 km away. The Copper River Delta, AK (CR) was the single most important stopover site with 61% of the radiomarked westerns detected there. Male western sandpipers were significantly more likely to be detected before the CR and females on or after the CR. Length of stay of westerns at stopover sites other than their banding locations was correlated to distance from the Copper River Delta. No significant difference in length of stay between sexes was detected. Mean migration time, measured in terms of day last seen at the banding site to day first detected at the CR varied significantly between banding sites. Significant differences between males and females in mean migration time were detected.

#### CONTINUED GROWTH OF DOUBLE-CRESTED CORMORANT POPULATIONS ON THE GREAT LAKES, 1992-1995

D.V. Chip Weseloh, Peter J. Ewins, and Karen E. Pettit, Canadian Wildlife Service, Environment Canada, Box 5050, Burlington, Ontario L7R 4A6.

In 1991 there were approximately 38,000 nests (pairs) of Double-crested Cormorants on the 5 Great Lakes - a 300-fold increase from the population levels in 1972. During 1992-1995, popu-

lation levels have continued to grow but with some fluctuations. We estimate the Lakes-wide population for 1994 was over 50,000 nests (pairs). In 1995 we surveyed only Lake Ontario, which contains 13 cormorant colonies including the single largest colony on the Great Lakes at Little Galloo Island. In 1993 and 1994, population levels at Little Galloo decreased by 12.7% and 21.0%, respectively; the Lake Ontario population also decreased in 1994 by 6.3%. This was the first such decrease in more than 20 years. In 1994, productivity for the then 3700 nest colony was <0.1 young per nest. We hoped this decline represented a levelling off of the population, i.e. density dependent factors acting on the largest colony. In 1995, the population on Little Galloo increased by a dramatic 102% to over 7500 pairs and colony wide productivity was > 2.0 yg/pair.

## POPULATION CHARACTERISTICS AND FOOD HABITS OF COMMON MURRES AND RHINOCEROS AUKLETS ENTANGLED IN GILL NET FISHERIES IN PUGET SOUND, WASHINGTON 1993-1994

*Monique L. Wilson\**, Washington Dept. of Fish & Wildlife, 7801 Phillips Road S.W., Tacoma, WA. 98498, *Darlene DeGhetto D.V.M.*, NE 95th Street, Seattle, WA. 98115, and *D. John Pierce*, Washington Dept. of Fish & Wildlife, 600 Capitol Way North, Olympia, WA. 98501-1091. To reduce the impact of gill nets on seabirds, it is necessary to understand how the life history of each species as well as environmental factors influence the probability of entanglement. During the 1993 and 1994 sockeye (late July-early September) and chum (October-early November) salmon gill net fisheries in Puget Sound, Washington, 254 Common Murres and 70 Rhinoceros Auklets were collected from gill nets by fishery observers. The age, sex, molt status, and stomach content data were recorded. Sex ratios were 1:1 in adult, juvenile, and young of the year murres and auklets throughout both fisheries. Most (63%) of the murres entangled were adults, whereas the majority (63%) of entangled auklets were young of the year. Nearly half (45%) of Murres collected during July-September

were "flightless", whereas 6% collected during October-November were "flightless". Eight fish species in murres and seven species in auklets (11 overall) were identified from stomach contents. Pacific Sandlance and Pacific Herring were the most frequently occurring prey species identified. The management implications of these results for future gill net fisheries will be discussed.

## DIEL PERIODICITY AND DIETARY BREADTH OF THE BLACK SKIMMER: IMPLICATIONS FOR COEXISTENCE IN A MIXED SPECIES COLONY OF BREEDING SEABIRDS IN SOUTHERN CALIFORNIA

*Jacqueline F. Wilson\**, and *Michael H. Horn*, Dept. of Biological Science, California State Univ., Fullerton, CA 92634.

Diel activity patterns and food habits of a population of Black Skimmers were studied where they nested with Caspian, Elegant and Forster's Terns on a small island and adjacent marsh at the Bolsa Chica Ecological Reserve in Orange County, California. Night vision goggles aided the investigation of 24-hour activity cycles and direct observations and analysis of dropped fish samples provided the data on dietary breadth. Skimmers were significantly more active at night than during the day, and distinct peaks of activity occurred at dusk and dawn corresponding to departures from and returns to the nesting island. Skimmers fed mainly on Northern Anchovy, Topsmelt and Pacific Sardine, and their dietary overlap with the three co-occurring terns appeared to be lessened by a combination of differences in prey size and composition and foraging location. Their surface-limited, largely tactile feeding method may result in greater foraging success per unit effort at night, given that prey fish are more abundant in the upper few centimeters at night, as shown by our day and night surface samples, and better able to avoid capture during the day.

## COMPARISON OF TWO METHODS FOR ESTIMATING INCUBATION STAGE OF SEABIRD EGGS

*James M. Zingo*, Massachusetts Cooperative Fish & Wildlife Research Unit, Univ. of Massachusetts, Amherst, MA, USA,

01003, *David A. Shealer*, Dept. of Biology, Rutgers Univ., Piscataway, NJ, USA, 08855, and *Christopher M. Michaud*, Dept. of Forestry & Wildlife Management, Univ. of Massachusetts, Amherst, MA, USA, 01003.

We compare two methods (average daily mass loss, flotation) for estimating incubation stage of seabird eggs using the Roseate Tern as a model. We measured lengths and breadths of 183 eggs from 90 nests and weighed them either daily or several times each throughout incubation. Thirty-two (16 two-egg clutches) of these eggs were immersed in water daily and their flotation characteristics were recorded. Using the equation  $K_w = \text{FRESHMASS}/(L \cdot B^2)$ , we calculated the mass constant to be  $K_w = 0.5166 \pm 0.0012$  (mean  $\pm 2SE$ ). Estimated fresh masses of the same eggs using linear measurements and  $K_w$  were similar to measured fresh masses (mean error = +0.03%, range -5.3%, +4.1%), suggesting that fresh mass can be estimated in most cases to within  $\pm 5\%$ . Egg mass declined by about 0.6-0.7% per day of incubation for a total loss of about 14-16% of the initial mass. Eggs immersed in water first floated to the surface when 7-13.

## PRELIMINARY RESULTS OF HARLEQUIN DUCK BREEDING POPULATION SURVEYS ON THE KODIAK NATIONAL WILDLIFE REFUGE, ALASKA

*Dennis C. Zwiefelhofer*, Kodiak NWR, 1390 Buskin River Rd., Kodiak, AK. 99615.

Abundance and distribution of harlequin ducks in coastal and freshwater habitats of the Kodiak National Wildlife Refuge were determined in 1994 and 1995. Coastal surveys were conducted within the Exxon Valdez oil spill impact zone, while interior surveys focused on watersheds known to receive the most public use. Surveys covering over 900 kilometers of shoreline in western Kodiak Island archipelago adjacent to Shelikof Straits were conducted twice (May & August) during the breeding seasons of 1994 and 1995. All observations within the 200 meter survey zone were logged directly into an onboard computer interfaced with a Global Positioning System unit. Number



of Harlequin Ducks decreased 16% between the May (n=4369) and August (n=3684) surveys of 1994, but a 10% increase in total numbers was seen during the same period of 1995 (May; n=3317; August; n=3693). Ninety-six sightings of harlequin ducks were recorded for 5 interior watersheds. A minimum of 65 coastal and 11 interior broods containing 248 and 34 young respectively, were found during the 2 years of survey. Coastal densities of harlequins declined from 5.1 (May) to 3.7 (August) ducks/km of shoreline in 1994 and remained constant at 4 ducks/km of shoreline during both 1995 surveys.

POPULATION TRENDS OF  
SEADUCKS WINTERING IN KODIAK

ALASKA - A SIXTEEN YEAR STUDY  
*Denny Zwiefelhofer*, USFWS, Kodiak National Wildlife Refuge, P.O. Box 825, Kodiak, AK 99615, and *Douglas J. Forsell\**, USFWS, Chesapeake Bay Field Office, 177 Admiral Cochrane Dr., Annapolis, MD 21401.

We have conducted shipboard surveys of marine birds in Uyak and Uganik Bays on the western shore of Kodiak Island each February since 1980. Birds were censused within 300 m strip transects of 10 minutes duration run from shore to shore. The same cruise tracts were followed each year resulting in about 135 transects covering about 110 km<sup>2</sup> or 19 percent of the surface area of the bays. Population increases were seen in Bar-

row's goldeneye, harlequin ducks, common mergansers, and red-breasted mergansers. Relatively stable populations were found for surf scoters, black scoters, and oldsquaw. White-winged scoters have shown a slight decline over the past 15 years. Declines in Barrow's goldeneye, oldsquaw and all scoters were seen following the *Exxon Valdez* oil spill, but not in harlequin ducks, mergansers, or bufflehead. Little oil actually entered these bays and many birds had departed for breeding areas by the time the oil arrived. Population variation is compared with the USFWS waterfowl breeding population survey and band recoveries

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# BULLETIN BOARD

## Announcing The Seabird Network Bycatch Working Group

### Cooperative Solutions to Seabird Bycatch Problems

A joint project of the Institute for Fisheries Resources and the National Fisheries Conservation Center

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The Seabird Network Bycatch Working Group is a major cooperative effort among fisheries, conservation and scientific organizations to not only seriously address the issue of seabird bycatch on the basis of the best available science, but to arrive at real-life solutions. It also makes use of modern communications technology to greatly leverage our outreach, impact and effectiveness, while minimizing costs. Using "Internet" technology, the proposed Seabird Network electronically convenes scientists, conservationists, and fishing leaders throughout the west coast (and worldwide) to do the following:

- 1) Assess the problem, gather all the scientific data on seabird bycatch (now widely scattered) into one readily available form easily accessible by computer modem, and to review and critique the current status of all relevant research;

- 2) Recommend priorities for future study and funding at state and federal levels, based upon an assessment of where entanglements are most likely to cause significant population-level impacts;

- 3) With the help of those actually in the fishery, to identify and promote new fishery strategies to reduce the impact of fishing methods where appropriate, including the development and evaluation of new gear types and techniques designed to minimize or altogether avoid unwanted bird bycatch; and

- 4) Advocate sound conservation and management policies regarding bird entanglement, including working to identify and help secure funding for key additional research to make better conservation possible.

Thanks to modern electronic networking, this work can be truly international by involving literally hundreds of participants from all over the world, be ongoing (rather than just a single event such as a

conference), be fully accessible to the general public from any desktop computer, be electronically recorded, and be conducted at only a fraction of the costs any such effort would have entailed in the past.

The Seabird Network has established a publicly accessible World Wide Web (WWW) site at:

<http://www.pond.net/~fishlifr/ifrpg1.html> and an E-mail "Listserver" to promote round table discussions and scientific working groups among scientists, agencies and citizens involved in bird conservation and fisheries issues. Notice of our electronic discussions and report will be posted to all relevant Internet mailing lists and in fisheries and conservation publications throughout North America and Europe.

The Network will deal with a variety of species, but the initial focus will be on the marbled murrelet in the Pacific Northwest of North America. Fisheries interactions with this species have generated concerns that are urgent in both biological and socio-political terms. Among bird species known to be incidentally caught in fisheries, only the marbled murrelet is listed under the US Endangered Species Act as well as the Migratory Bird Treaty Act. The fragile and protected status of this species has raised the possibility of population-level impacts from fisheries. Likewise, the future of some commercial salmon fisheries depends upon sound conservation of these birds.

In addition, the Network expects to research and publish a report on seabird interactions with fisheries by January, 1997. This report will summarize the findings and recommendations of the Network, provide a basis for public policy makers to evaluate proposed actions for seabird conservation in fisheries, and lay out a proactive strategy for continuing research and action.

The Seabird Network Bycatch Working Group is a collaborative effort of the Institute for Fisheries Resources (affiliated with the Pacific Coast Federation of Fishermen's Associations) and the National Fisheries Conservation Center, organizations known for fostering cooperation among fishing and conservation leaders to solve problems. Participants and advisors will include representatives of the National Audubon Society, the Center for Marine Conservation, National Fisherman Magazine, the American Fisheries Society, fishermen's groups, many state and federal agencies and a number of reputable institutions dealing with fisheries research and management in both the US and Canada.

**TO JOIN THE NETWORK:** You only need E-mail capability and access to the World Wide Web. Please indicate your interest and e-mail your name, surface mailing address and phone/fax, what agency or organization (if any) you are with, and a brief description of your interest and expertise on this issue to the Institute for Fisheries Resources at: [birdbycatch-request@pond.net](mailto:birdbycatch-request@pond.net). This will be the staff E-mail address for this Project. Project coordinators will be Glen Spain, Program Director for the Institute for Fisheries Resources, and Brad Warren, Executive Director of the National Fisheries Conservation Center. For more information you may also contact Glen Spain, Institute for Fisheries Resources, at PO Box 11170, Eugene, OR 97440-3370, USA. Telephone: (541) 689-2000 or Facsimile: (541) 689-2500.



## Third International Penguin Conference, Cape Town

The African Seabird Group is organizing the Third International Penguin Conference at the Breakwater Lodge, The Victoria & Albert Waterfront, Cape Town, South Africa, 2-6 September 1996. The sponsors have issued a call for papers under the broad theme "Penguins: science and management." The conference fee is USD 250 (\$150 for bona fide students), with a penalty of \$50 for registrations received after 30 June 1996. The proceedings will be published in the African Seabird Group's international journal, *Marine Ornithology*.

For further information contact John Cooper by e-mail: [jcooper@botzoo.uct.ac.za](mailto:jcooper@botzoo.uct.ac.za), facsimile: +27-21-650-3295 or at the following address: Third International Penguin Conference, c/o African Seabird Group, P.O. Box 34113, Rhodes Gift 7707, South Africa

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A gratis copy of the 1976 Proceedings on Birds of the Sea and Shore (474 pp, published by the African Seabird Group in 1981) is included with the offer. The proceedings may also be purchased separately for USD 20 or UKPound 10.

1996 personal subscriptions to *Marine Ornithology* are USD 30 or UKPound 20,

and may be added to the above amount to bring you up to date.

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*Marine Ornithology* is an international, fully refereed journal dealing solely with seabirds. The 1976 Proceedings contains papers on both seabirds and charadriid waders.

Please send enquiries to [jcooper@botzoo.uct.ac.za](mailto:jcooper@botzoo.uct.ac.za) or post cheques directly to: "African Seabird Group, PO Box 34113, Rhodes Gift 7707, South Africa."

**John Cooper**, Seabird-1 Co- Percy FitzPatrick Institute of African University of Cape Town, Rondebosch 7700, South Africa, e-mail: [jcooper@botzoo.uct.ac.za](mailto:jcooper@botzoo.uct.ac.za), Facsimile: +27-21-650-3295, Telephone: +27-21-650-3294

## Joint ICES/JNCC/Seabird Group Symposium On Seabirds In The Marine Environment

There has been much intensive research on the breeding biology of seabirds but despite their role as Important predators at the top of the marine food chain, our knowledge of seabirds and their marine ecology remains patchy. The relationship between seabirds and the marine environment has proved particularly difficult to study. The reasons for this are diverse but are mainly practical and logistical ones. Unlike terrestrial birds, most seabirds inhabit a comparatively inaccessible environment for the major part of the year, and therefore their lives. However, the mosaic of habitats that comprise the open sea and their influence on seabird dispersion and behavior are increasingly a focus of attention in seabird research. This research focuses on seabirds as marine organisms that are behaviorally and

ecologically adapted to life at sea and on seabird communities as important components of the marine ecosystem. Knowledge of the life of seabirds at sea is seen as crucial to a complete understanding of this ecosystem. A major, international symposium that aims to report on current progress in ecological research on seabirds at sea will occur in November 1996.

### Scope

There will be several important themes of the Symposium, but the overall focus will embrace all aspects of seabird biology at sea.

The nature of seabird dispersion will be a major topic of interest. Long running research programs, especially in north-western Europe, have elucidated patterns of distribution and abundance of birds at sea. Appropriate ways of describing these patterns, especially with regard to scale, will be featured. Patterns of seabird biodiversity, as revealed using numerical methods, also will be highlighted.

Identification of the physical and biological processes that govern patterns of dispersion follows logically from a description of these patterns. The spatial associations between seabirds and their prey and also hydrographical features such as fronts have been examined using multivariate models. Such techniques also should aid in illuminating community attributes of seabird aggregations at sea. This will be an important theme of the Symposium.

In addition to aspects of dispersion, the main subject area of seabirds at sea research has been foraging and feeding ecology. Overcoming the obvious technical difficulties has not proved easy but recent work, including radio-tracking studies, has advanced greatly our knowledge of where, when and how seabirds gather food. The Symposium will consider this area in some depth and will emphasize the importance of feeding ecology as an Influence on seabird survival and population growth.

Energetic factors clearly influence all aspects of seabird life In the open sea. Energetic studies of seabirds at sea either direct or modeling approaches also will be a significant theme.

The impact of fishing and fisheries on seabird populations has dominated much research and thought in recent years - for example, work on the effects of fishery discards. Implications for the ecology of seabirds at sea will be explored further at this meeting.

Breeding biology research will not be excluded from the Symposium program but it will have as its main focus the activities of birds away from the breeding site or colony.

The Symposium has four main objectives: 1) to critically review recent themes in the ecology of seabirds at sea and suggest future directions; 2) to report on current scientific research in marine ornithology; 3) to provide a forum for scientists to meet and discuss issues in seabird research; 4) to serve as a platform, for seabird ecologists to communicate the results of their work.

### Format

Contributions to the Symposium will be of three kinds. Invited oral presentations on selected topics will be given by acknowledged leaders in their respective

fields. These papers will aim to review and assess current progress in these topics. Submitted oral presentations on any aspect of the ecology of seabirds at sea will follow the invited contributions in thematic sessions. Oral presentations will take place in non-overlapping sessions. Posters, again on any relevant topic, will be displayed during the Symposium. The organizers are particularly keen to attract marine scientists from disciplines outside ornithology.

The Symposium will be in English.

### Organization

The Symposium is jointly organized by the International Council for the Exploration of the Seas (ICES - the pre-eminent international body concerned with fisheries and marine science), the Joint Nature Conservation Committee (JNCC - the government agency that advises the United Kingdom government on nature conservation issues in the UK and in the wider international context) and the Seabird Group.

The scientific program of the Symposium will be organized by a committee comprising Kees Camphuysen, Bob Furness, George Hunt, Jim Reid and Mark Tasker.

### Date and Venue

The Symposium will take place in the Department of Zoology, University of Glasgow, Glasgow, UK from 22-24 November 1996. A choice of bed and breakfast and hotel accommodation will be available close to the University. Details of these will be sent to those registering for the Symposium.

### Participation

Participation in the Symposium is open to all with an interest in seabird ecology. Those wishing to contribute to or attend the Symposium should contact Dr. Jim Reid, 'Seabirds in the Marine Environment', Joint Nature Conservation Committee, 7 Thistle Place, Aberdeen, UK. Telephone: +44-1224-646181, Facsimile: +44-1224-621488, e-mail: jim.reid@aberdeen.ac.uk

Contributors of oral presentations and posters will receive guidance on the sub-

mission procedure and should submit an abstract of not more than 250 words in the agreed format by 1 May 1996.

The Symposium fee is 80, inclusive of lunches and Symposium dinner and exclusive of accommodation.

### Publication

The Symposium Proceedings will be published as a special volume in the ICES Symposium Series. Invited and submitted presentations will be selected for publication following a peer review process. Poster abstracts also will be published.

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## Italy Becomes A High Seas DriftNet Nation

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In the April 29, 1996 Federal Register, the U.S. Department of Commerce identified Italy as "a country for which there is reason to believe its nationals conduct large-scale driftnet fishing beyond the exclusive economic zone of any nation." If Italy does not terminate these activities immediately, the importation into the USA of fish, fish products, and sport fishing equipment from Italy will be prohibited under the High Seas Driftnet Fisheries Enforcement Act. Italian driftnet vessels will be denied entry into U.S. ports and navigable waters. The U.S. statute and the policy behind it are a mechanism to enforce the world-wide ban on large-scale high seas driftnet fishing, which was banned by the United Nations General Assembly several years ago

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## Pacific Seabirds Submission Deadline

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The deadline for submitting materials to be included in the next issue of Pacific Seabirds is September 15, 1996. All material, except those relating to conservation issues, should be sent to The Editor. Conservation related material should be sent to the Vice-Chair for Conservation. General news items of interest to the membership for placement in the Bulletin Board and PSG News are always welcome. Please contact Pacific Seabirds for formatting instructions prior to submitting items.

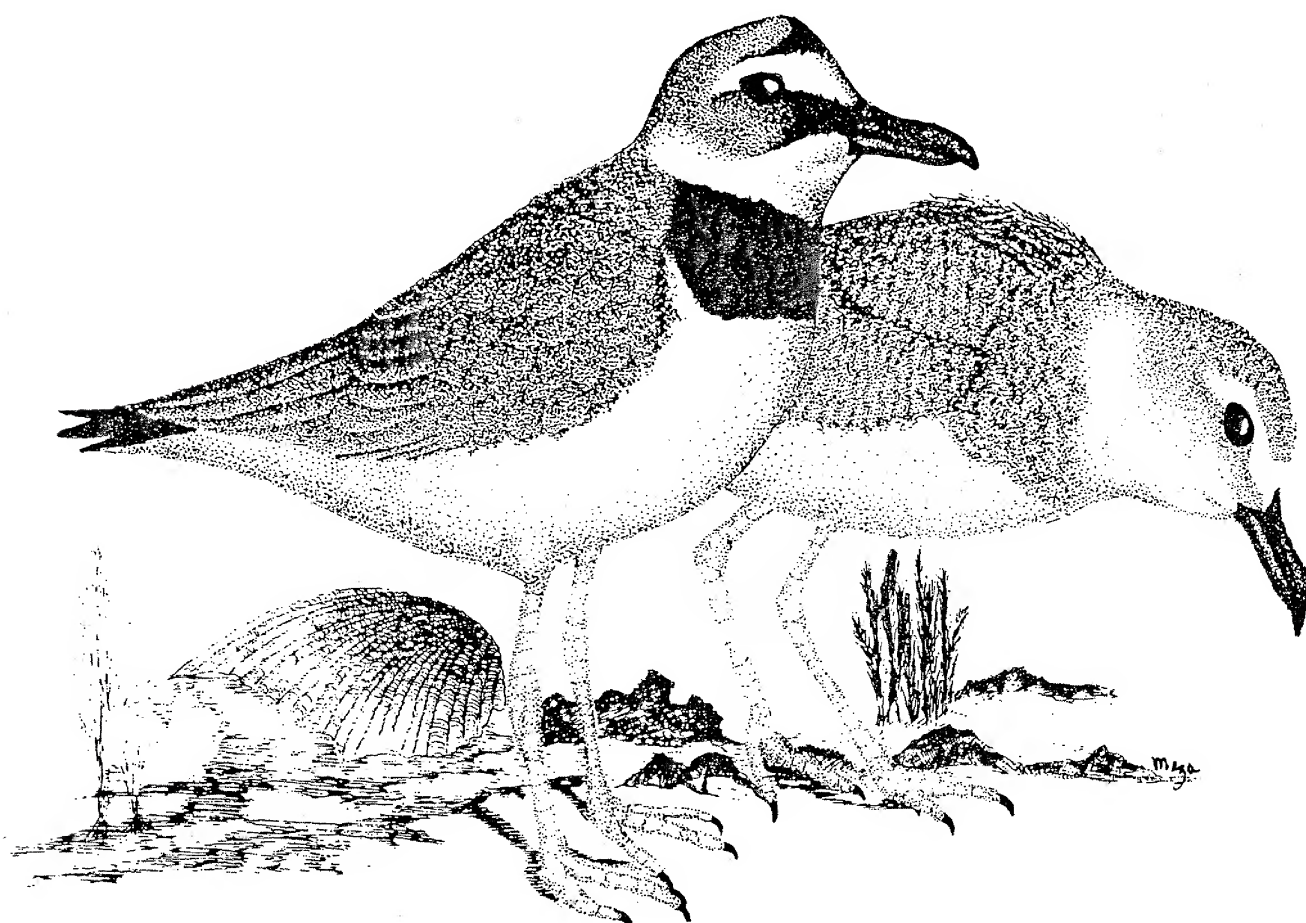
Pacific Seabirds is particularly interested in receiving short technical notes and longer review articles relating to seabirds and their environment. Submitted articles will be sent out for peer review before their potential acceptance for publication in Pacific Seabirds, or as PSG Technical Publications. Contact The Editor, or the Publication Committee, respectively, for details.



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Pacific Seabirds welcomes the submission of art depicting marine birds in their environment. Individual works of art may be published as space is available. A caption, including a title, species identification, location and the name of the artist, should be included with each submitted work.

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# REPORT OF THE SECRETARY

## Minutes Of The November 1995 Pacific Seabird Group Executive Council Meeting

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The Executive Council met on 8 and 12 November in Victoria, British Columbia. Twelve Council members attended (Bairn, Everett, Flint, Hodder, Lovvorn, Gaston, Irons, Lowe, Mendenhall, Rauzon, Speich, and Takekawa).

Note: This meeting was the second in 1995. In effect it takes the place of a 1996 meeting, which will not be held.

The minutes of the January 1995 meeting were approved, with a correction (a resolution on the Queen Charlotte Islands had been passed).

### Meetings

The Victoria meeting was held jointly with the Colonial Waterbird Society. The Council agreed that the meeting's schedule was good—several plenary sessions (hour-long talks by invited speakers), and plenty of time at coffee breaks and lunch to talk with colleagues. There were concurrent sessions, as at the last meeting.

The next meeting of PSG (the 24th) will be in Portland, Oregon, in early 1997. Guaymas, Mexico, had previously been considered for the 1997 meeting, but the Council decided that two foreign meetings in a row might make attendance difficult for government people. The 1998 meeting will be at Asilomar. Since 1998 will be PSG's 25th year, we may hold special events, including a symposium.

Planning for meetings will be done 2 to 3 years ahead, if possible. In the future (as in the past), meetings may be held either in urban settings, which are the most accessible, or in more rural areas, which are aesthetically appealing. The Council emphasized that the Chair-Elect, who plans the scientific program, is authorized by the By-laws to accept or reject any abstract.

Guidelines were adopted to encourage student participation. Reduced registration fees and other perquisites will be offered, if allowed by the budget.

### Financial matters

Jan Hodder reported that PSG's income is approximately equal to our operating expenses. Our bank accounts contain about 2 years' expenses, which matches the Council's guidelines. Our biggest fiscal obligation usually is the annual meeting. Other major expenses are *Pacific Seabirds*, the activities of officers and committees, and dues to organizations of which PSG is a member.

The Council changed PSG's fiscal year from January 1-December 31 to October 1-September 30. The change will allow accounts for each annual meeting to be balanced within a single fiscal year.

The Endowment Fund receives all Life Membership dues, and it is supposed to grow through investment. The fund cannot be touched until it reaches \$100,000; at present it is about half that size. How to make the fund grow faster is a perennial concern of the Council. We decided that all proceeds from the sale of publications (after expenses have been met) will be added to the fund. The Council favored diversifying the fund's portfolio, which currently is limited to Government bonds, by investing part of it in securities that are not insured by the government. This will require an amendment of the PSG By-laws. The Endowment Fund is managed by three Trustees who are Life Members. The Council decided that the Treasurer will be an ex-officio member of the Trustees, and that the Chair will appoint a new voting Trustee.

### Contracts to and from PSG

PSG has started to acquire substantial contracts, such as those from the *Exxon Valdez* Trustee Council and the National Biological Service. Such contracts can advance the purposes of PSG, but they entail additional responsibilities. Costs of accounting, taxes, and administration could be offset by charging overhead.

Contracts entail potential problems, as well. The Council must (under nonprofit corporation laws) approve all contracts and proposals. If contracts are approved properly, individual members will not be liable in case of disputes over contracts.

Building on the PSG 2000 results, an ad hoc committee will evaluate the role of contracts in expanding our research and conservation efforts.

The issue of PSG's small grants was tabled for one year, pending efforts to raise more funds.

### Committee reports

The Seabird Monitoring Committee requested Council approval of a contract with the National Biological Service, whereby PSG would obtain data for the Seabird Monitoring Database from the Point Reyes Bird Observatory and Simon Fraser University.

The Marbled Murrelet Technical Committee has discussed its functions and will concentrate on reviewing technical protocols; the Executive Council will give final approvals. Protocols are in preparation for Inland and At-Sea surveys. A newsletter is being published in cooperation with the U.S. Forest Service.

The Japanese Committee assisted two American biologists during 1995 with a small grant. Surveys were done, and a report on rare alcids was submitted to the Japan Alcid Society. Two PSG members will participate in an international expedition to the Bonin Islands. The Committee is looking for a Japanese member to be its coordinator.

The Xantus' Murrelet Technical Committee is working on a proposal that the U.S. Fish and Wildlife Service list the species as threatened or endangered. The committee is waiting for data from another agency.

The Restoration Committee is working on a preliminary report on the results of the *Exxon Valdez* Restoration Work-



shop that was held in Anchorage in October 1995. The preliminary report will assist the Exxon Valdez Trustee Council, who supported the workshop, in screening applications for 1996 funding. A full report will follow in 1996, and the committee also is working on restoration plans for the *Tenyo Maru* and *Apex Houston* spills.

The Executive Council discussed questions that have arisen during PSG review of government and industry documents, including oil spill restoration plans. The Council stated that PSG offers our expertise impartially to either government or industry. PSG reviews documents by soliciting expert reviews from members and others. The committee in charge of the issue then combines the responses into a letter. PSG sometimes takes positions on controversial documents; major statements of policy or opinion always should be reviewed by the Executive Council before being released. Individual reviewers' opinions also can be sent separately to the originator of the document.

The Elections Committee reported few problems, except that 25% of all voters voted for regional representatives throughout the world, instead of for their own regions only. Names of write-ins may be suggested for nomination in the future.

#### Other issues

Kent Wohl reported that the jurisdiction of the U.S. government over seabirds may soon be extended to 200 miles. The Migratory Bird Treaty Act has applied only out to 3 miles from shore since it was passed in 1918. Marine mammals and fisheries, which are covered by more

recent legislation, already are protected out to 200 miles. The Departments of Justice and Interior have now agreed to extend jurisdiction. The intention would be to strengthen the Fish and Wildlife Service's voice in management of seabirds, not on prosecution of unintentional killing.

Development could threaten seabird colonies on some tropical islands. PSG will seek information on projects planned for Clipperton Island from French seabird conservationists and development authorities. The Fish and Wildlife Service is keeping an eye on Red-footed Booby nesting forests on Palmyra Island, where development is planned for support of the fishing industry.

PSG is a member of the Ornithological Council, the lobbying arm of the ornithological community for scientific and conservation issues, such as collecting permits and the Endangered Species Act. PSG's Executive Council approved an increase in our yearly dues to the OC (\$500).

#### Awards

PSG gives Special Achievement Awards, Lifetime Achievement Awards, and Student Paper Awards. A Vermeer Award for conservation work also was given at the Victoria meeting by the Local Committee. The Council established an Awards Committee to coordinate nominations for PSG's annual awards. Recipients will be confirmed by the Executive Council, and awards will be given at the next meeting (one year later). The Council requested the Victoria local committee to submit a proposal if they wish PSG to participate permanently in the Vermeer Award.

#### Publications

*Pacific Seabirds* will be edited by Steve Speich, following Martha Springer's resignation. He needs more articles, particularly technical articles for peer review and summaries of interesting issues. Technical Publications are expected to include the Marbled Murrelet protocols. We have purchased excess stocks of our past symposia that will be offered for sale.

#### Executive Council matters

A summary of the last ten years' Council meetings (policies discussed and motions passed) has been compiled by the Secretary. A copy is available from her. The Secretary's files are lacking minutes for several years. If past secretaries have old minutes, PLEASE send them to Vivian!

Now that Council members have E-mail, we often discuss issues between annual meetings "on line". (If a member isn't on line, materials are sent by ordinary mail.) It was noted that E-mail is not confidential, so sensitive matters should be discussed by telephone or mail. A more difficult problem is that Council decisions cannot be made by E-mail under California corporate law. The Council can only vote by mail (with 30 days' notice, and unanimously) or at a special meeting. In an attempt to solve this problem, the Council voted to allow the six officers to decide unanimously on contracts or grant applications by telephone or E-mail. [Note by the Secretary: As of late May 1996, no Council votes have been taken by this method.]

*Vivian Mendenhal,*  
Secretary

# REPORT OF THE TREASURER - 1995

At the Victoria Executive Council meeting it was decided to change the reporting timetable for PSG's finances to better reflect the annual cycle of the organization's cash flow and hopefully to give the membership, (and the treasurer), a clearer understanding of PSG's financial status. The largest percentage of PSG's income

and expenses are associated with either membership dues, which are mostly collected at the beginning of the year, or are a result of our annual meeting, which is normally held between November and February. Thus it was decided that the financial year for PSG will run from October 1st to September 30th, encompass-

ing the active financial period of the organization, and giving us all a better picture of the organization's finances. To facilitate this change this report encompasses the period from 1 January 1995 to 30 September 1995 which I will refer to as the reporting period.

Table 1. Pacific Seabird Group Balance Sheet, September 30, 1995

Account	Balance	
	September 30, 1995	December 31, 1994
1995 Local Committee (San Diego)	-	\$12,220.31
Baja Initiative	-	\$11,815.00
Bulletin Account	\$2,985.77	\$188.03
<sup>1</sup> Dean Witter - Endowment Account	\$53,599.13	\$48,735.55
Dean Witter - Savings Account	\$16,884.03	\$8,355.74
EVOS Workshop	\$28,619.48	-
Treasurer's Checking (Charleston)	\$2,454.56	\$4,179.92
Treasurer's Checking (Tenino)	-	\$1,253.38
<sup>2</sup> United Kingdom Savings	\$722.17	\$604.14
<b>Total Assets</b>	<b>\$105,265.14</b>	<b>\$87,352.07</b>
<b>Liabilities and Equity</b>		
<sup>3</sup> Liabilities	\$32,319.48	\$2,500.00
Equity	\$72,945.66	\$84,852.07
<b>Total Liabilities and Equity</b>	<b>\$105,265.14</b>	<b>\$87,352.07</b>

## Footnotes

<sup>1</sup> Total reflects actual dollar amount deposited or interest earned. Deposits are made by purchasing shares, the dollar amount of which fluctuates with the market. On September 30, 1995 we had 5,718.65 shares at \$9.03 per share. If assets and equity are calculated using this price per share instead of the dollars deposited the balance sheet totals for the 1995 reporting period would be \$ 103,305.42 and \$70,985.94 respectively compared with the 1994 totals of \$82,096.11 and \$79,596.11 respectively.

<sup>2</sup> The United Kingdom account is managed by Mark Tasker and is used for deposits of membership dues paid in pounds. A conversion rate of one pound sterling to 1.61 US dollars was used.

<sup>3</sup> \$28,619.48 for the EVOS workshop and \$3,700 to publish the 1993 marbled murrelet symposium.



### Income and Expenses

The gross income for the reporting period was \$111,906.20, of which \$72,011.33 (64%) was associated with the EVOS sponsored workshop and \$16,087.63 (14%) with the Baja Initiative held at the San Diego annual meeting. Income from this annual meeting received in 1995 totaled \$12,114.39 (11%). Complete accounting for this meeting was presented in *Pacific Seabirds* Vol. 22 No. 2. Membership dues paid in 1995 amounted to \$5816.03 (5%) and interest and dividend income provided \$2867.83 (3%). Income

from fund raising and publication sales amounted to \$2409 (2%). Expenses for the reporting period totaled \$89,985.78. Expenses reflect the sources of income, the largest expenses were for the EVOS workshop, \$43,341.82 (48%); the Baja Initiative, \$21,292.95 (24%); and the San Diego annual meeting, \$17,484.52 (19%). The production of the 1995 spring issue of *Pacific Seabirds* cost \$2,438.22 (3%), committee expenses amounted to \$1,765.51 (2%), and expenses for publications for resale were \$671.49.

### Membership

Membership dues and library subscriptions are essentially our working capital and with the moving of the annual reporting period we will have a better picture of the amount of income we derive yearly from this source. As of September 30, 1995 PSG membership totaled 475, of which 54 are life members, 32 are family members, and 37 are student members. Forty-three members joined at the San Diego meeting, of these memberships 20 were sponsored by the Baja Initiative.

Table 2. Pacific Seabird Group, Cash Flow Report, 1 January - 30 September, 1995

<b>Income</b>	
Annual Meeting - San Diego (1995 Totals)	\$12,114.39
Baja Initiative	\$16,087.63
EVOS Workshop	\$72,011.33
<sup>1</sup> Fund Raising	\$1,883.00
Interest Earned (Checking accounts)	\$35.96
Income Dividend (Dean Witter - Endowment)	\$2,303.58
Income Dividend (Dean Witter - Savings)	\$528.29
Life Membership Dues	\$1,830.00
Membership Dues	\$3,986.03
Page Charges (for marbled murrelet symposium)	\$900.00
Publication Sales	\$526.00
<b>Total Income</b>	<b>\$111,906.20</b>
<b>Expenses</b>	
Annual Meeting - San Diego	\$17,484.52
Annual Meeting - Victoria	\$2,501.57
Baja Initiative	\$21,292.95
Bank Charges	\$34.70
<sup>2</sup> Dues	\$450.00
EVOS Workshop	\$43,341.82
Officer and Committee Expenses	\$1,765.51
<i>Pacific Seabirds</i>	\$2,438.22
Publications	\$671.49
Taxes	\$5.00
<b>Total Expenses</b>	<b>\$89,985.78</b>
<b>Total Income over Expenses</b>	<b>\$21,920.42</b>

### Footnotes

<sup>1</sup> Includes \$500 from sales of the marbled merlot wine, and \$1,383 from the auction at the San Diego annual meeting.

<sup>2</sup> Ornithological Council \$250; Bird Conservation Alliance \$200

## REPORT OF THE SECRETARY

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Of the 55 members that joined at the Sacramento meeting 31 (56%) renewed their membership in 1995. Twenty-seven libraries have paying subscriptions to *Pacific Seabirds*

### Bylaw Change

The bylaw that will permit income from dues or contributions to be placed in

a federally insured financial institution, or invested in financially secure stocks, bonds, or mutual funds passed with 141 yes votes and 12 no votes.

### Victoria Annual Meeting

The finances for the 23rd annual meeting of the Pacific Seabird Group held in Victoria, B.C. were handled by the local

committee, headed by Rob Butler. Our thanks are due to him for the complete and timely report of the meetings finances. PSG received a profit from the meeting of \$641.84. The cash flow from this meeting is presented in Table 3.

Jan Hodder,  
Treasurer

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Table 3. Pacific Seabird Group Twenty-third Annual Meeting, Victoria, B.C., November, 1995, Cash Flow

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<b>Income</b>	US \$
Registration	\$25,425.35
Banquet and Field Trips	\$8,024.80
Grant from Canadian Wildlife Service	\$2,149.50
<b>Total Income</b>	<b>\$35,599.65</b>
<b>Expenses</b>	
General Meeting Expenses	\$21,611.91
Banquet and Field Trips	\$9,612.45
Plenary Speaker's Expenses	\$1,941.83
Colonial Waterbirds Exec. Council Meeting	\$208.41
PSG Exec. Council General Meeting	\$208.37
Marbled Murrelet Meeting	\$733.00
<b>Total Expenses</b>	<b>\$34,315.97</b>
<sup>1</sup> <b>Total Income over Expenses</b>	<b>\$1,283.68</b>

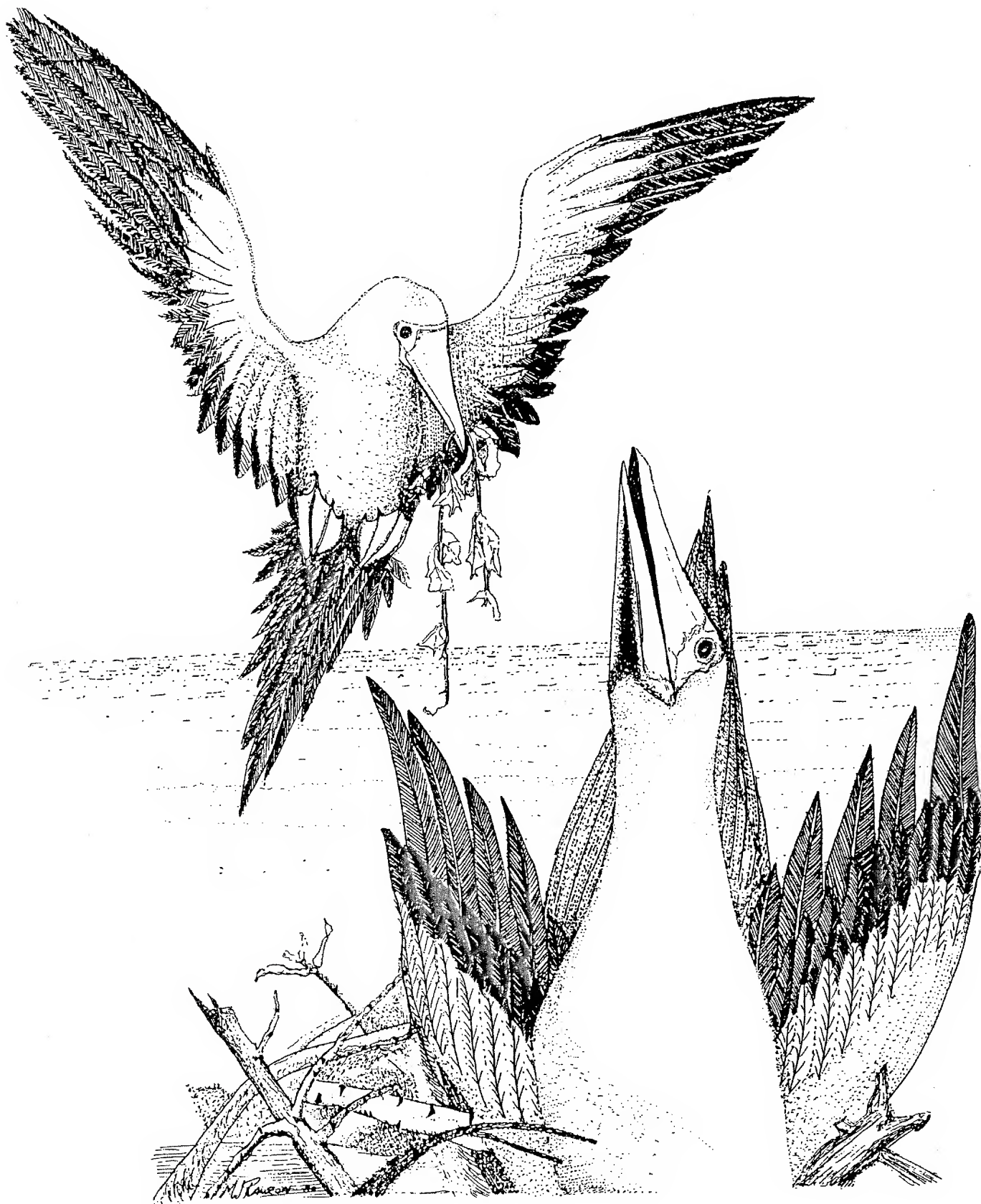
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### Footnotes

<sup>1</sup> The income generated by this meeting was divided equally between the Colonial Waterbird Society and PSG.

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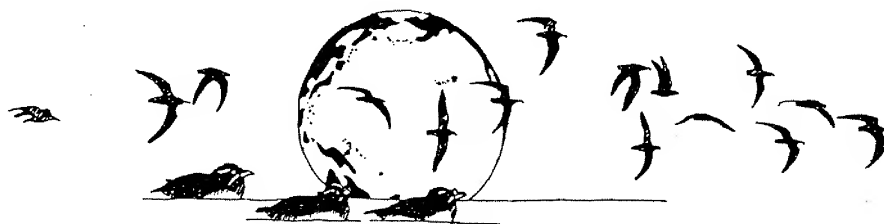




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# PUBLICATIONS

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## A SYMPOSIUM OF THE PACIFIC SEABIRD GROUP

### BIOLOGY OF MARBLED MURRELETS: INLAND AND AT SEA

S.K. NELSON AND S.G. SEALY (editors)

in NORTHWESTERN NATURALIST, Volume 76, Number 1, 1995

#### CONTENTS

Introduction by S. K. Nelson and S. G. Sealy

#### *Inland*

Marbled murrelet activity relative to forest characteristics in the Naked Island Area, Prince William Sound, Alaska by K. J. Kuletz, D. K. Marks, N. L. Naslund and M. B. Cody

Tree and habitat characteristics and reproductive success at marbled murrelet tree nests in Alaska by N. L. Naslund, K. J. Kuletz, M. B. Cody and D. K. Marks

Description of two marbled murrelet tree nests in the Walbran Valley, British Columbia by I. A. Manley and J. D. Kelson

Characteristics of three marbled murrelet tree nests, Vancouver Island, British Columbia by K. M. Jordan and S. K. Hughes

Marbled murrelet distribution in the Siskiyou National Forest of southwestern Oregon by C. P. Dillingham, R. C. Miller and L. O. Webb

Two marbled murrelet nest sites on private commercial forest lands in northern California by S. J. Kerns and R. A. Miller

Behavior of marbled murrelets at nine nest sites in Oregon by S. K. Nelson and R. W. Peck

Fledging behavior, flight patterns, and forest characteristics of marbled murrelet tree nests in California by S. W. Singer, D. L. Suddjian and S. A. Singer

Use of boat-based surveys to determine coastal inland habitat associations of marbled murrelets in Prince William Sound, Alaska by D. K. Marks, K. J. Kuletz and N. L. Naslund

Use of radar to study the movements of marbled murrelets at inland sites by T. E. Hamer, B. A. Cooper and C. J. Ralph

#### *At Sea*

Preliminary observations on juvenile:adult ratios of marbled murrelets in Auke Bay, southeast Alaska by H. L. Anderson and S. R. Beissinger

At-sea activity patterns of marbled murrelets adjacent to probable inland nesting areas in the Queen Charlotte Islands, British Columbia by M. S. Rodway, J.-P. L. Savard, D. C. Garner and M. J. F. Lemon

Decline of marbled murrelets in Clayoquot Sound, British Columbia: 1982-1993 by J. D. Kelson, I. A. Manley and H. R. Carter

Distribution of marbled murrelets along the Oregon Coast in 1992 by C. S. Strong

Use of mist nets to capture murrelets over the water by R. A. Burns, G. W. Kaiser and L. M. Prestash.

To Order: send \$20.00 USD (postage and handling included), check or money order, made payable to the Pacific Seabird Group, to Jan Hodder, Treasurer, Pacific Seabird Group, Oregon Institute of Marine Biology, University of Oregon, Charleston, OR 97420 USA. Government and institution purchase orders accepted.



## Published Proceedings Of Symposia Of The Pacific Seabird Group

At irregular intervals the Pacific Seabird Group holds symposia at its annual meetings. The published symposia are listed below. Available symposia may be purchased by sending a check or money order (in US Dollars) to Jan Hodder, Treasurer, Pacific Seabird Group (made payable to PSG), Oregon Institute of Marine Biology, University of Oregon, Charleston, Oregon 97420 USA. Prices include postage (surface rates) and handling. See the following membership application/publication order form, to order symposia.

**SHOREBIRDS IN MARINE ENVIRONMENTS.** Frank A. Pitelka (Editor). Proceedings of an International Symposium of the Pacific Seabird Group. Asilomar, California, January 1977. Published June 1979 in *Studies in Avian Biology*, Number 2. Out of print.

**TROPICAL SEABIRD BIOLOGY.** Ralph W. Schreiber (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Honolulu, Hawaii, December 1982. Published February 1984 in *Studies in Avian Biology*, Number 8. \$12.00.

**MARINE BIRDS: THEIR FEEDING ECOLOGY AND COMMERCIAL FISHERIES RELATIONSHIPS.** David N. Nettleship, Gerald A. Sanger, and Paul F. Springer (Editors). Proceedings of an International Symposium of the Pacific Seabird Group, Seattle, Washington, January 1982. Published 1984 as Canadian Wildlife Service, Special Publication. Out of print.

**ECOLOGY AND BEHAVIOR OF GULLS.** Judith L. Hand, William E. Southern, and Kees Vermeer (Editors). Proceedings of an International Symposium of the Colonial Waterbird Society and the Pacific Seabird Group, San Francisco, California, December 1985. Published June 1987 in *Studies in Avian Biology*, Number 10. \$18.50.

**AUKS AT SEA.** Spencer G. Sealy (Editor). Proceedings of an International Symposium of the Pacific Seabird Group, Pacific Grove, California, December 1987. Published December 1990 in *Studies in Avian Biology*, Number 14. \$16.00.

**STATUS AND CONSERVATION OF THE MARBLED MURRELET IN NORTH AMERICA.** Harry C. Carter, and Michael L. Morrison (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Pacific Grove, California, December 1987. Published October 1992 in *Proceedings of the Western Foundation of Vertebrate Zoology*, Volume 5, Number 1. \$20.00.

**THE STATUS, ECOLOGY, AND CONSERVATION OF MARINE BIRDS OF THE NORTH PACIFIC.** Kees Vermeer, Kenneth T. Briggs, Ken H. Morgan, and Douglas Siegel-Causey (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Canadian Wildlife Service, and the British Columbia Ministry of Environment, Lands and Parks, Victoria, British Columbia, February 1990. Published 1993 as Canadian Wildlife Service, Special Publication, Ministry of Supply and Services, Canada, Catalog Number CW66-124-1993E. Free. Write: Publications Division, Canadian Wildlife Service, Ottawa, Ontario, K1A 0H3, Canada.

**BIOLOGY OF MARBLED MURRELETS - INLAND AND AT SEA.** S.K. Nelson and S.G. Sealy (Editors). Proceedings of a Symposium of the Pacific Seabird Group, Seattle, Washington, February 1993. Published 1995 in *Northwestern Naturalist*, Volume 76, Number 1. \$20.00.

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# PACIFIC SEABIRD GROUP COMMITTEE COORDINATORS

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Contact committee coordinators for information and activities of committees and how you can participate.

## Conservation Committee

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## PSG LIFE MEMBERS 1996

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# Pacific Seabird Group

## Membership Application/Publication Order Form

(Please Copy)

### Membership (includes subscription to *Pacific Seabirds*)

Individual and Family	\$20.00	\$ _____
Student (undergraduate and graduate)	\$13.00	\$ _____
Life Membership <sup>1</sup> (optional payment plan, six \$100 installments)	\$600.00	\$ _____
Sponsored Membership	\$20.00	\$ _____

### Contributions<sup>2</sup>

To the Endowment Fund <sup>2</sup>	\$ _____
Other (please specify)	\$ _____

### Back issues of *Pacific Seabirds*

Vols. 1-8 (1974-1981)@ \$2.50/issue (two issues/year)

Specify Vol. and No. \_\_\_\_\_ x \$2.50 \$ \_\_\_\_\_

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*Status and Distribution of the Marbled Murrelet in North America* \_\_\_\_\_ x \$20.00 \$ \_\_\_\_\_

*Biology of Marbled Murrelets: Inland and at Sea* \_\_\_\_\_ x \$20.00 \$ \_\_\_\_\_

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Charleston, OR 97420, e-mail jhodder@oimb.uoregon.edu

Prices include postage (surface rate) and handling.

Total enclosed \$ \_\_\_\_\_

<sup>1</sup> See front cover Tax Donations Status

<sup>2</sup> Proceeds from life Memberships and contributions go to the Endowment Fund, a fund to support the publications of the Pacific Seabird Group.

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# PSG EXECUTIVE COUNCIL 1996

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